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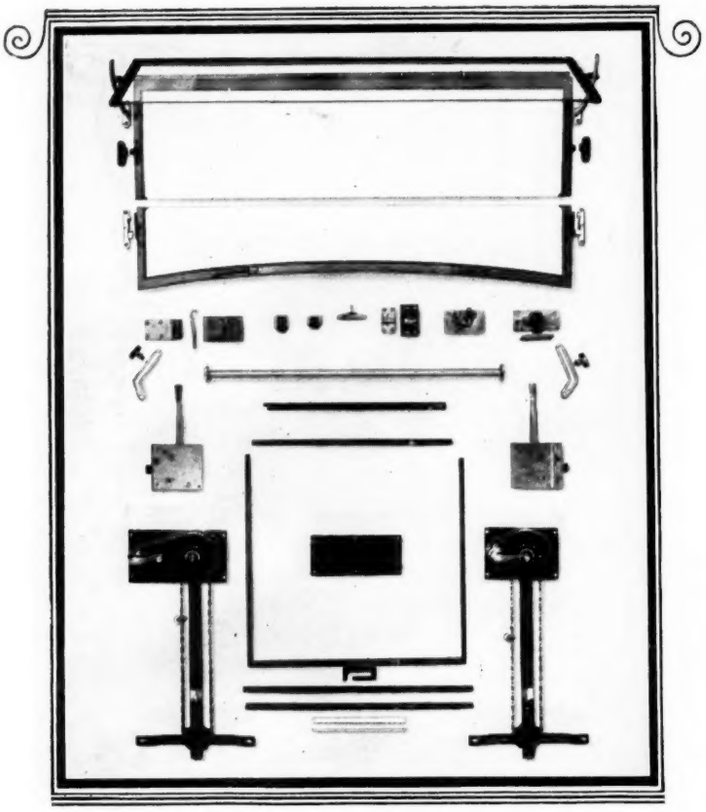

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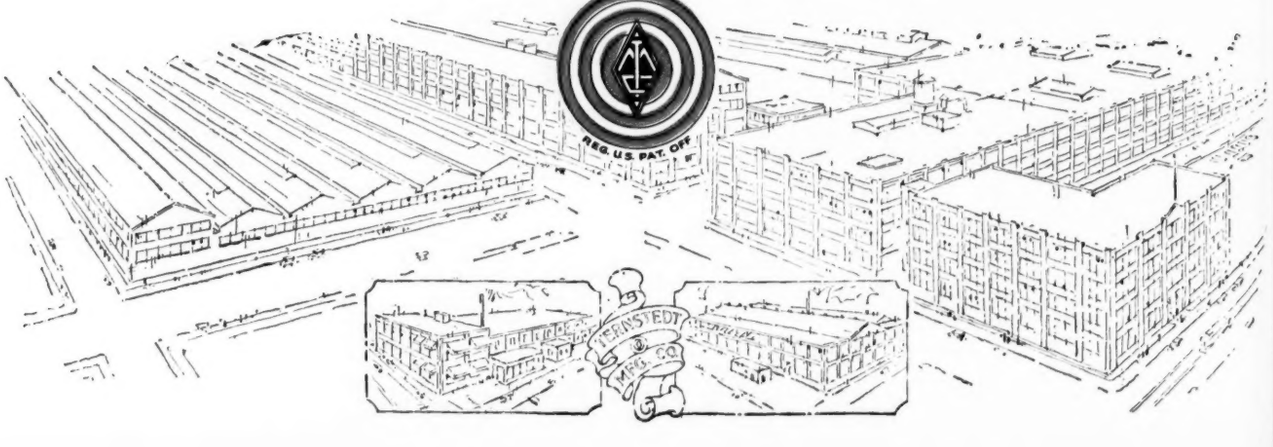

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Better Transport Methods Urged at Engineers Meeting

Alfred H. Swayne asks industry to support railroad program to be worked out by U. S. Chamber of Commerce committee. First S. A. E. Automotive Transportation session gives large share of attention to other types of carrier. Coordination desirable.

By Norman G. Shidle

VITAL need for better correlation and more efficient operation of transport facilities in the United States was the point stressed most strongly at the first Automotive Transportation Meeting of the Society of Automotive Engineers held in Cleveland April 26 to 28. A detailed study of recent rear axle tests was presented by the Bureau of Standards, taxicab body construction was given attention and several other topics were mentioned incidentally. But the big thought that the session developed was that of getting better transportation.

Alfred H. Swayne, vice-president, General Motors Corp., made the most significant statements of the meeting when he bespoke the support of the automotive industry for whatever constructive plan for railroad development may be worked out by the transportation conference committee, which recently began to function under the direct auspices of the U. S. Chamber of Commerce and under the indirect auspices of Herbert Hoover and the Administration.

"I think this subject is one of very great importance to all of us," Swayne said, "I hope you men will study it and will think about it, and I hope that when the Chamber of Commerce of the United States has developed this plan and does introduce it to the public and to Congress that you will support it and that you will do all in your power to develop a sound public opinion behind it."

Swayne told the story of the formation of this transportation conference committee on which is represented every form of transportation. He told about Hoover's statements to the first meeting of the representatives of the various transportation interests in New York. Hoover stated, Swayne said, that the Administration believes the railroad question will be a major issue in the 1924 Presidential campaign; that unless something constructive is done to improve the transportation situation, we will drift into Government ownership of railroads. Hoover does not believe Government ownership is for the best interests of the country, Swayne stated, and called the conference with a view to seeing what could be done along constructive lines to improve conditions.

THE automotive industry, Swayne said, is one of the biggest customers of the railroads. As such, it has a vital interest in seeing that the railroads are allowed to earn a fair return from their operations, that efficient and adequate transportation may be obtained. Without effective railroad service the automotive industry cannot carry on its own business successfully.

Representing the automotive interests, Swayne told a later gathering of transport representatives in Washington that the automotive industry was ready to cooperate in putting over any constructive plan that

might be developed to relieve the railroads. He said that such a plan would have to be developed and agreed upon by the railroads, however, as they knew their own business better than anybody else.

"They told us that as shippers we ought to take an interest in the problem," Swayne went on. "Our answer was 'What shall we do? What do you want us to do? We do take an interest. What shall we do of a constructive nature?'"

THE railroads objected that any plan they might put forward would immediately be looked upon with suspicion by the public. Swayne pointed out that the U. S. Chamber of Commerce, or some of its allied bodies might sponsor the scheme, but that it would first be necessary for the railroads to come to some agreement among themselves as to what really constitutes a constructive railway program. Railway executives have the reputation, Swayne said, of not being able to sink their differences and work together.

Alfred H. Swayne, vice-president General Motors Corp., who outlined plans for cooperation with railroad interests

The Administration railroad program embodies three chief points, according to Swayne's personal opinion. These are as follows:

1. Consolidation of lines in the interests of economy and efficiency.
2. Scientific revision of rates.
3. Consolidation of Railway Labor Board and Interstate Commerce Commission, so that railroad income and outgo will be controlled by the same body.

The railroads played fully as important a part as the motor vehicle in this automotive transportation gathering. Swayne prefaced his talk by saying that he would express the views which, in his opinion, the automotive industry should take toward the railroads. He believes it is to the interest of the automotive industry to support private ownership of railroads. W. H. Lyford, vice-president of the Chicago & Eastern Illinois Railway, discussing F. C. Horner's paper on "English Cartage Practice," came out strongly in favor of store-door delivery, but emphatically opposed any attempt to get the railroads into the business of truck operation and maintenance.

Horner's paper described in detail the successful operation of terminal trucking by the British railways. Major Brainerd Taylor outlined a plan for the coordination of motor and rail transport facilities that has been developed by the Motor Transport Division of the Quartermaster Corps. Robert S. Binkerd, Committee on Public Relations of the Eastern Railroads, told the well-known story of how efficient railroad operation has been hindered by restrictive legislation.

In all the discussion about coordinating railway and highway transport, no essential differences of opinion developed. Complete accord was not reached as to who should operate trucks used in terminal haulage, but the need for the larger development of such facilities was generally proclaimed. J. F. Murphy, Columbia Terminals Co. of St. Louis, read a paper in which he gave an excellent example of how terminal haulage with tractor and semi-trailer equipment can be successfully operated with satisfaction to the railroads, the shippers and the transport operators.

Only two or three of the twelve talks given at the meeting were technical in character, the other speakers devoting their attention to a consideration, very detailed in certain instances, of the broader aspects of motor transportation.

There can be no adequate analysis of highway transportation without considering fully and constantly its relation to rail and water transport at every point. Certain forms of truck transportation are independent of the activities of the other types of carrier, but these instances are rare. In almost every case, highway transport is linked up in some way with other transport media.

A BRIGHT future for the motor truck was predicted by both automotive and railroad interests speaking at the meeting. Lyford praised very highly the terminal haulage work which is being done with demountable bodies and with tractor-semi-trailer equipment and voiced his belief that store-door delivery will grow materially in the future.

The motor truck will gradually take away from the railroad much of the l.c.l. freight, which is now a burden to the latter, Binkerd said, while S. G. Thompson of the White Motor Co. painted a glowing picture of truck development to date and of its possibilities for progress in the future.

The retail delivery field offers a tremendous field for the right truck, according to Harold B. Wess of R. H. Macy & Co. Wess thinks this field has not yet been developed except to a limited extent, while W. J. L. Banham of the Otis Elevator Co. sees very wide possibilities for more extensive and efficient use of motor vehicles.

Attendance at the meeting was about 175. George S. Graham was toastmaster at the dinner on Thursday evening. He was introduced by President Herbert Alden as "one of the greatest high-powered, worm-drive toastmasters in the United States." B. B. Bachman and F. W. Davis presided over the two motor truck sessions on the first day of the gathering, while Herbert Alden was chairman of the motorbus session and A. J. Scaife of the taxicab session on the second day. Saturday was devoted to plants visits which included the White Co., National Malleable Casting Co. and the Nela Laboratories.

Trucks Help Other Carriers to Handle Freight

J. F. Murphy tells about tractors and semi-trailers used in St. Louis. British haulage practice, rear axle tests, taxicab construction and operation other topics treated.

A PRACTICAL example of how motor trucks can increase railway efficiency was given by J. F. Murphy, vice-president, Columbia Terminals Co., St. Louis, in his paper on "Successful Tractor and Semi-Trailer Railroad-Terminal Haulage." Murphy pointed out that the ability of railroads to handle freight is limited by their terminal facilities. He then went on to show how the truck has been able to increase those facilities in one specific instance. His talk is specially interesting to the manufacturer since it indicates clearly the wide possible market for motor vehicle equipment in railroad terminal work, and shows in some detail the type of equipment and performance needed for such service.

"The field for the more extensive use of automotive transportation," Murphy said, "has many possibilities, some of which I know are now being given close study. The more important benefit may be summarized as follows:

(1) In the correlation of railroad and automotive transportation is afforded the solution of adequate terminals in large cities as has been demonstrated in St. Louis.
(2) Less-than-carload traffic interchanged between railroads at terminal centers can be handled more economically by automotive transportation than by rail carriage.
(3) Universal off-track depots, which can be constructed in industrial districts within large cities at locations that would be inaccessible if not prohibitive by the cost of the right-of-way to reach them by rails, serve the railroads and the business community better than would on-track depots.
(4) In the correlation of railroad and automotive transportation, the use of tractor semi-trailer equipment improves the service and reduces the hauling cost per ton.
(5) The extension of automotive transportation as an efficient hauling medium, in conjunction with the railroads and in commercial service, depends upon how well the equipment is fitted to accomplish the service for which it is to be used."

Discussing these benefits in more detail, Murphy said in part:

It is a recognized fact that the capacity of our railroads is fixed by that of their terminals. It is obvious, therefore, that such facilities as tend to relieve the rail terminals of business that can be handled otherwise correspondingly increase the capacity of the rail terminals to handle the volume of freight that, on account of its character, must move through such channels and, perforce, increase the capacity of our railroads as a whole.

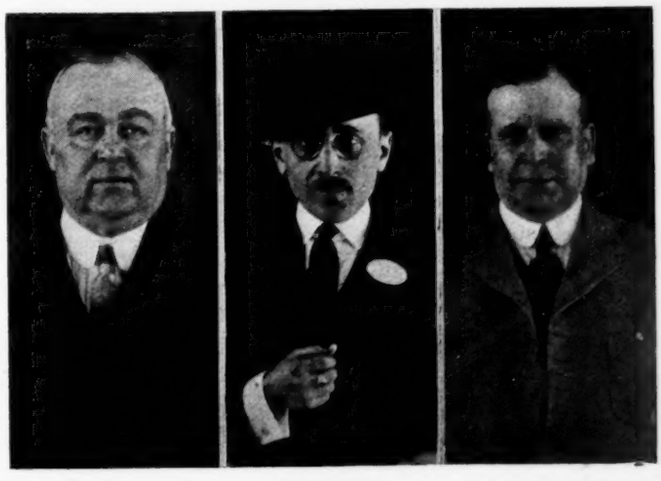
In St. Louis this is now being done by the company I represent. Using semi-trailer automotive-transportation, it relieves the rail terminals of practically all of the less-than-carload freight that is interchanged between the Western trunk lines terminating in St. Louis and the Eastern railroads having depots in East St. Louis, Ill., across the Mississippi River, as well as the major portion of the less-than-carload merchandise shipped from and destined to St. Louis proper. Thus, in the correlation of rail and automotive transportation for the handling of both interchange and St. Louis merchandise it has been made possible to handle carload and less-than-carload business more expeditiously in St. Louis than at any other terminal center in the country.

For the handling of the less-than-carload merchandise of a city, adequate freight facilities mean terminal facilities sufficient to handle such traffic promptly, with freight depots located so as to be accessible at a minimum drayage haul to the greatest number of shippers and receivers of less-than-carload freight.

In St. Louis such facilities are furnished by our company in the operation of universal off-track depots conveniently located, to which merchandise shipments for any one or for all of the 24 railroads serving that city, including the Illinois Traction Co. and the Federal Barge Line, may be delivered to, or received at, any one of such universal off-track depots, thereby reducing the cartage or haulage expense to shippers and receivers of freight.

These universal off-track stations serve the railroads and the business community better than would on-track railroad-depots by virtue of the following facts: A universal freight depot on-track for the receipt and delivery of less-than-carload merchandise for all St. Louis railroads would, by its perforced location, entail an increase in drayage expense to shippers and receivers of freight. Moreover, such a universal freight depot of sufficient capacity to handle the less-than-carload merchandise of all St. Louis railroads and permit the loading thereof in box cars, so as to insure through service with a minimum transfer of shipments from car to car en route, would require, if located at a point convenient to the greatest number of shippers and receivers, a space of such size that the cost of its acquisition would be prohibitive.

One universal freight depot on-track of less than that capacity, or several such stations on-track, would not represent adequate facilities; for, in the interest of service and the conservation of box-car equipments, the transfer or consolidation of shipments at other stations would be necessary. In addition, such handling, owing to the light



Col. E. S. Stayer *H. B. Wess* *J. F. Murphy*

loading of this class of freight, would take a large quantity of equipment from other service for which it might at the time be needed urgently, to say nothing of the additional tax that would be placed on the rail terminal-facilities in the handling of these cars.

The location of individual freight depots in St. Louis by each railroad for the handling of less-than-carload merchandise would not insure better service to shipments, and it would increase the cartage expense of shippers and receivers of freight, unless they should have straight loads to and from each depot, which, with most of them, would be very infrequent.

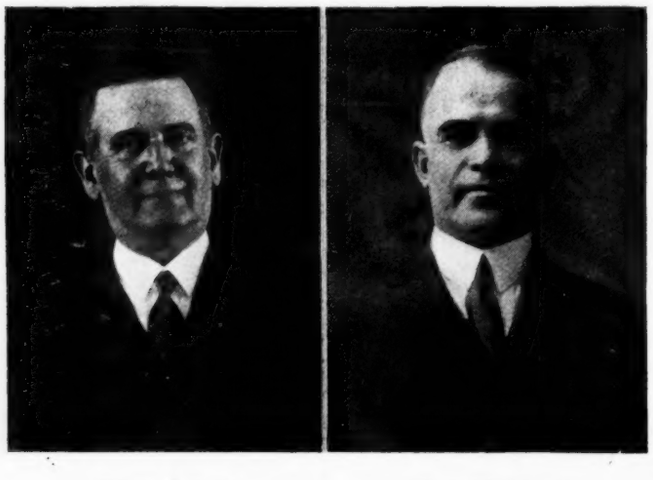
Routing Shipments

A shipper's truck loaded by 1.00 p. m. could scarcely deliver freight to 12 or more different railroad depots between that hour and 5.00 p. m.; whereas, if delivery were made by 2.00 p. m., which could be done to the most conveniently located of our universal off-track depots, we would make delivery of the shipments to the 12 or more railroads in time for forwarding the same day. This applies likewise to inbound shipments, those that may have been shipped from a dozen different points over as many different railroads, being available for hauling from the universal off-track inbound-depot that the consignee may elect as the facility at which he desires to accept receipt of his shipments.

In St. Louis our company now has eight universal off-track depots; five for the handling of outbound and three for the handling of inbound freight, from and to which less-than-carload St. Louis rates apply, no extra charge being made to shipper or consignee for the movement or handling of freight by our company, the charge for our service being absorbed by the railroads out of their published tariff rates to and from St. Louis.

Our facilities thus become in every respect those of the railroads; and, operating as agents for all railroads terminating in St. Louis and East St. Louis, Ill., in the transfer of both inbound and outbound freight between our eight universal off-track depots located on the west side of the Mississippi River and the various railroad freight depots located in St. Louis and East St. Louis, Ill., we have developed a system of automotive transportation that, for practical purposes, places our universal depots "on-track," so to speak, by what amounts virtually to the operation of non-track railroad transportation through the congested industrial section of St. Louis.

Under this system we handle nearly 7,000,000 lb. of merchandise daily, representing 466 carloads per day, loaded to 15,000 lb. each, or approximately 145,000 carloads per year, and that number of box cars is thereby released for other service. This enormous tonnage is handled more expeditiously and at less cost to the railroads than they could handle it through their terminals.



W. H. Lyford *S. G. Thompson*

Four years ago it was found that, with a few minor changes, a certain semi-trailer could be constructed so as to meet our requirements fully. We began, as an experiment, with one tractor and three semi-trailers and the trial proved so successful, practical and economical that 4 additional tractors and 12 additional semi-trailers were ordered immediately. Upon further experiments, we determined upon a policy of displacing our teams and truck equipment with tractor and semi-trailer equipment as rapidly as circumstances would permit. At that time we had in service 600 horses, 350 stake wagons and 72 motor trucks with a capacity of 5 tons, as against 5 tractors and 15 semi-trailers in use 2 years ago, we now have in operation 56 tractors and 168 semi-trailers, with some of the teams and motor-truck equipment yet to be displaced, as 200 wagons and 55 motor trucks are still being operated and 17 of the 72 motor trucks operated 2 years ago have been converted into tractors at our own shops.

Not being an engineer, I am unable to give a technical description of the semi-trailers we used, but I shall endeavor to describe briefly how they work and point out their utility and adaptability in the transportation of merchandise. For efficient operation they should be loaded dead; that is, the tractor during the loading and unloading of semi-trailers should be engaged in the hauling of other semi-trailers under load. Each semi-trailer stands as a unit on four wheels while being loaded and unloaded and, when ready to move, the coupling of tractor and semi-trailer is done instantaneously and automatically, being controlled by the chauffeur while in his seat in the cab. The same operation automatically releases the brakes and elevates the front-end supporting-wheels of the semi-trailer, the load in motion thus being on six wheels, the four wheels of the tractor and the two rear wheels of the semi-trailer. These semi-trailers are equipped with internal expanding drum-brakes that automatically control them while in process of coupling or uncoupling with the tractor, as well as preventing them from over-running the tractor when descending a grade or making a stop on the level.

Coupling Automatic

During the operation, the tractor chauffeur remains in his seat; the coupling is done automatically. The tractor, backing-up, lifts the front end of the trailer by engaging the guide wheel with the mounting tracks, then locks the trailer to the fifth-wheel coupling-device on the tractor chassis. The same operation automatically releases the brake and elevates the supporting wheels of the trailer. The whole operation can be reversed by pulling a lever in the chauffeur s cab.

Experience has proved to us the advantages of the semi-trailer over motor trucks operated under similar conditions. Our records show that the average daily mileage of our 5-ton motor-truck was not over 20 miles and, moving at 10 m.p.h., which is about the limit of speed that can be maintained on frequented city streets, they were in actual productive service only 2 hr. daily, the other 6 hr. of a business day being consumed in their loading and unloading operations.

Murphy's paper received highly favorable comment from A. F. Masury, S. G. Thompson and F. W. Davis, all of whom commended his methods.

B. B. Bachman questioned the accuracy of the statement that "the ratio of hauling capacity to carrying capacity between trucks and tractor-semi-trailer equipment for equivalent motor size is three to one. He be-

lieves this is true only because the truck is built for general use rather than for a very specific application.

Replying to a question from M. C. Horine, Murphy said that his company had chosen tractor and semi-trailer equipment in preference to trucks with demountable bodies, because the demountable bodies take up space and congest the railroad platforms, despite the fact that they do release the truck for further service.

Col. H. W. Alden pointed out that a terminal haulage company in Cincinnati is doing a very successful job, similar to that of Murphy's company, but that the Cincinnati organization is using demountable bodies. He asked Murphy how his ton-mile cost compared with that of the Cincinnati company. Figures were not available to answer the query.

Study of British Haulage Methods May Help Solve Terminal Problems

AMERICA can learn some valuable lessons from the English in connection with commercial trucking and railroad terminal haulage in the opinion of F. C. Horner, of the General Motors Corporation, who read a paper on "English Cartage Practice as a Criterion for American Motor Trucking."

Many wasteful and inefficient methods are apparent to Horner in the present handling of terminal freight. Some of the troubles are due to the railroads, some to the commercial haulers and some to the shippers. The best solution to the problem of terminal trucking, Horner thinks, "will be found by organizing either one national system for the whole country or else one system in each of our large cities."

In addition to discussing the general aspects of the American terminal trucking question, Horner gave a very detailed outline of methods now in use by British cartage companies. Part of his remarks follow:

I wish to make it very clear that, in my opinion, the wasteful and chaotic methods of collecting and delivering the miscellaneous goods at the railway terminals in our cities is just as much the fault of the traders and the cartage companies as it is of the railways themselves. Unless all three agencies are willing to give and take and to cooperate in every sense of the word, existing conditions will never be remedied, but will go on getting worse until eventually it will result in seriously retarding the development and prosperity of the country, and this will come sooner than some may think.

In the first place, it certainly seems reasonable to say that the railroads and all other transport undertakings should be run on the same plan as any sound business undertaking. In other words, the transport companies should be permitted to earn a maximum return on their investment consistent with an efficient and economical transportation service. Referring to the railroads in particular, as they are the principal agencies concerned, it seems only fair to permit them to accumulate a surplus in good years to carry them over bad years.

Sources of Waste

The greatest sources of waste in our present transportation system are, first, where the railway stops and cartage begins; and, second, in the short-haul field.

The best way of attacking this problem is, in my opinion, as follows: There are four major classes of goods to be transported commonly known as carload, less than carload, express and parcel post. The first can be eliminated for the moment. The remaining three, then, are the cause of most of our transportation waste, but especially the first of these. Here is where there is the greatest room for improvement, in the cartage of l.c.l. freight between the railway terminal and the store door.

All are more or less familiar with the confusion and loss of effectiveness that result from the absolute lack of any systematic method of railway-terminal cartage. You also know that, due to the absence of scientific loading, routing and scheduling methods, it is common practice to have 5-ton motor-trucks leaving terminals and store doors with only a few hundred pounds of goods, not to mention the degree to which this sort of wasteful transportation prevails with smaller sizes of motor trucks and horse-drawn vehicles.

An executive of one of the largest railroads in this country stated recently that between 400 and 500 cars could be released per day in one city alone if his railroad could get rid of the intra-city haul. Think what such a saving would mean to that railroad and to the merchants of the country in one year alone; it would make more than 150,000 cars available per annum for other work. Another railway executive said that the use of the present equipment for our railroads would be increased threefold by the elimination of terminal waste.

Since my return from Europe the picture I have got of this situation is that the railway men, whatever their record has been during the past, are now more than willing to cooperate with the traders and the public to work out some plan that will be satisfactory to everyone.

I will now relate some of the essential things about English-railway cartage methods for the collection and delivery of miscellaneous-goods traffic, as I am convinced that their plan contains the principal elements of a system that perhaps would not be a "cure-all" for us, but would, at least, be a vast improvement over our present disorganized practice.

The term miscellaneous goods is used by the English railways to cover the class of freight that we usually term l. c. l.; in other words, the freight composed of small consignments, not the carload or large shipments, the so-called "store-door delivery" variety, which, in England, is composed of consignments of about 300 lb. or less each.

Store-Door Delivery

The delivery of goods begins at the time the car door is opened, and ends at the time the cartage vehicle leaves the trader's door. The major steps between those two points are best divided as follows:

(1) Unloading and checking of goods from cars to platform or vans.
(2) Barrowing of goods to van-loading sections or warehouse.
(3) Loading and checking of goods onto cartage vehicles in district and street order.
(4) Loaded vehicles removed from sheds, and either parked by van setters or removed by carmen; accompanied by a pass, over scales and out into town for delivery.

The field for the motor truck lies in a properly coordinated, well organized collection-and-delivery service for the cartage, drayage, trucking, or whatever the term may be, of the miscellaneous-goods traffic of every railway terminal in every city of this country. I am not mentioning the short-haul traffic now performed by the railways within a 25-mile radius of our cities, and which offers a tremendous field for organized motor haulage.

It should be unnecessary for anyone to need to point out the field for the motor truck in this country for, in my opinion, the motor truck is on the eve of entering a field of activity that will make the transportation of people and things, from one part of the earth's sur-

face to another, cheaper and easier than today appears to be possible of accomplishment.

The opportunity awaits us and, if the transportation men of this country fail to take advantage of it, we deserve to suffer the consequences. I am convinced of one thing. To solve our transportation problem we must labor unceasingly, give and take, cooperate and grasp every opportunity we can to perfect ourselves. If we, all of us, railway men, road-transport men, traders and the public, earnestly and honestly do these things, we are sure to succeed.

Reliable Service Needed

Let me say in closing that the prosperity, comfort, convenience and intellectual growth of the people depend primarily upon the establishment and maintenance of a transportation service that is reliable, permanent and efficiently conducted. There has not yet been developed any transportation service of this character, except that of the steam railroads and the electric railways.

As a representative of the electric-railway industry I want to say that my industry recognizes the great service that can be rendered through the use of motor vehicles, and that it is using them and will use more of them in the future; but further, that any policy of competition which unwise automobile advocates may adopt is certain to be ruinous to themselves and to the railways, whether they be steam or electric; and once a railway stops operating it is extremely difficult to restore the service.

I trust that I have made clear to you in this discussion the fact that if your great industry and the electric-railway industry will cooperate, far greater benefit will flow not only to us but, what is more important, to the public that we serve.

W. H. Lyford, discussing Horner's paper, voiced his serious opposition to any attempt to get the railroads into the trucking business. He declared himself to be heartily in favor of a transportation service which would enable a merchant to ship from his door to the receiver's door. But such service should be rendered, Lyford thinks, by an independent company, operating a truck service in various cities and cooperating closely with the railroads. This company would simply pay the railroad for its service.

Lyford's objection to the railroads operating the store-door delivery is based upon the following facts:

1. Whenever a railroad organization has undertaken some outside activity its efforts have resulted in failure. Trucking is a specialized business which needs specialized talent to run it.
2. The public would be very suspicious of any such proposal if made by the railroads. It would think and say at once that the railroads were figuring out a new way to gouge the people.
3. It would be absolutely impossible to sell the idea to any considerable number of railway managers, because of the two reasons just given.

Demountable Bodies Praised

Lyford spoke favorably of the demountable body and the tractor-semi-trailer combination and pointed out that operating control has been worked out excellently in Cincinnati as well as in England.

Henry M. Crane said that it would be a great disappointment to automotive interests if the railroads were to go on record flatly stating that they would not extend their transport facilities beyond their own yards. He mentioned, however, several good reasons, including rigid rates and rigid profit limitations, which made it difficult for the railroads to go forward in store-door delivery work as rapidly as might be desirable from the shippers' standpoint.

A. J. Slade pointed out that we can learn some excellent motor transport lessons from abroad. He bespoke the support of automotive interests for the coordination of transportation plans now under way.

Concluding the discussion of his paper, Horner emphasized the fact that he does not favor any attempt to force the railroads into the trucking business and that he is not prepared to advocate any detailed plan without further study. He does believe, however, that some coordinated method of store-door delivery is needed to make our transportation system more efficient.

Roof of Taxicab Differs Greatly from Ordinary Top Construction

THE cost of a taxicab body is about 40 per cent of the total cost of the cab, according to Hugh G. Bursie, of the Haskelite Mfg. Corp., who read a paper on Taxicab Body Construction.

Taxicab service makes special demands on bodies, Bursie said, which necessitate a design somewhat different than that used in regular passenger car work.

The taxicab requires heavy sills and heavy doors, for example, while careful and conscientious workmen are particularly needed in forming body joints.

Taxicab roof construction differs very materially from that of the ordinary closed car. The panel roof is in universal favor with taxicab builders, Bursie stated. At present, all large quantity cab builders are using plywood molded roofs.

Bursie said in part:

The prospective purchaser of a taxicab is interested in the durability of the body as well as that of the engine and the chassis. Accordingly, taxicab-body design and workmanship are of such importance as to warrant their serious analysis and improvement.

First, heavy sills are very desirable. They are about 50 per cent heavier than in passenger-car bodies of the same size. Bent or formed sills are rarely, if ever used; it is customary to build-up the sills by screwing and gluing several pieces together to secure the required shape. Tests indicate that the four-piece construction is most desirable.

The door pillars and door frames are next in importance. Since the doors themselves must be exceptionally heavy so as to prevent warping, it follows also that their pillars must be correspondingly heavy. The rear pillars may be about 2 in. thick and should at no point have deep mortises or cut-outs that would weaken them at these places.

Such cut-outs weaken the pillars more than a computation of the section moduli would indicate, for the stresses tend to concentrate at these points. Rear doors, as light as those in passenger cars, will soon warp so that they will not close at the upper front-corners.

Front doors have the lock near the upper corner, and hence the lower corner tends to spring away so that it does not close flush. This can be remedied by screwing a diagonal steel strap to the door framework on the inside. This strap pulls the corner in; it subsequently can be covered by the door lining.

Mountain or white ash, *Fraxinus Americana*, is the best wood for frame members. The substitution of yellow poplar has been made to some extent, but its strength and screw-holding properties do not equal that of ash. The value of poplar lies in its use for miscellaneous parts, such as arm rests, that subsequently are uphol-

stered. Upholsterers like to work on poplar, because nails are easily driven into it.

Results of laboratory tests indicate that the different woods vary considerably in their screw-holding properties. The woods in this respect rank as follows: (a), sugar maple; (b), white ash; (c) white oak; and (d), yellow poplar. Poplar is very inferior in this respect but, as stated above, it is valuable for trimming strips to which upholstering is subsequently applied.

Joining Frame Members

The best method of joining frame members is that of gluing and screwing all joints of the frame members. Long screws are employed and carefully driven immediately after the application of glue to the joint. Animal glue is frequently used because of its convenience. In using this glue, it should be remembered that long-continued heating reduces its strength. Waterproof glues are valuable when care is taken in their proper mixing.

To secure tight frame-joints, careful workmanship is required. Modern woodworking machines have been highly developed so as to make the forming of the joints almost automatic, but these do not eliminate the need of careful, conscientious workmen for the actual assembly, men who will reject members that have been formed improperly.

Door hinges and locks have been an object of much study. The rear-door hinges are almost universally of the standard curved-joint pattern of malleable iron. From the standpoint of both durability and easy replacement, they are far better than the concealed type. They have the additional merit of carrying the door back as it swings, and thus increasing the width of the door opening. For safety's sake, rear-door catches are of the two-step variety.

Aluminum molding is used rather widely, not only on the body but also for the drip-rail on the roof. This molding can be fastened into place by screws or cement-coated nails. In the latter instance, a good method is that of spinning a conical circular hole in the molding by the use of a revolving center punch. This process forces the metal up, so that the metal subsequently can be hammered down in place after the brad is driven. The method described is one lending itself to fast production, and also one assuring that the finish on the molding will be relatively permanent.

Panel Roof Used

Taxicab roofs are designed and constructed far differently than are those for passenger cars. The panel roof is in universal favor with taxicab builders and, when properly constructed and installed, gives excellent service in all closed cars. The trouble that was formerly experienced with drumming or vibration has been practically eliminated by proper methods of installation. At present, all large-quantity cab-builders use plywood molded-roofs.

One method well known to the trade for dampening out roof vibrations consists of fitting felt or padding between the roof-panel and the ribs. However, this has been found only partially effective. Very frequently the drumming experienced in closed cars is not due to the roof, but rather to the glass; such drumming can be detected by placing one's hands on the window glass.

One method for eliminating rumbling has so far proved wholly effective; it consists in the installation of the roof in two pieces, the joint being over the partition between the driver and the passenger compartments.

The need of the greater strength afforded by a plywood roof is apparent when the strengths of the average roof-rails and roof-ribs are determined. For instance, a roof-rail of ash of average section 3 in. deep and 1⅞ in. wide, will deflect 1 in. under a horizontal side-load of 165 lb. applied at the center of a 90-in. length. Suppose that the load is distributed, say 10 lb. per rib for eight ribs in a 90-in. length, then the frame would be spread ⅝ in. at the middle portion. This shows how deficient the roof-rail and roof-ribs are with respect to lateral or transverse strength, and slats or wire-mesh do not increase its strength very much. Contrasted with this is the enormous strength of a plywood roof which will carry a weight of 1000 lb.

The panels are furnished by the manufacturers, molded to the required shape.

Practically all of the roofs are of the three-ply construction, ¼ or 5/16 in. thick. Upon receiving these panels from the manufacturer, the body-builder bandsaws them to shape from a template and then clamps and glues the panel to the roof-rail or the frame at all edges.

Some builders do not consider it necessary or even desirable to attach the passenger portion of the roof to the roof-ribs. In case the panel is nailed or screwed, a padding of loose felt is placed between the panel and the bows or ribs.

Finishing Process

After the shaping process already mentioned, the entire roof is covered either with glazed duck or with plain sheeting. The glazed duck is already finished, and need not be glued to the roof. However, the sheeting is easily glued to the roof-panel and is inexpensive, except that it requires a fairly good paint finish. A roof so constructed is light and durable, and affords a reliable watershed. In case the cloth covering is torn or ruptured, and this is unlikely because the roof-panel itself takes all the stresses, the panel itself will shed water; this saves the upholstering and the interior furnishings of the car until such time as the roof covering can be repaired.

This last point brings us to a consideration of the grade of plywood that is satisfactory for roof-panels. The plywood bonded by animal glue is not suitable. Expensive experience has shown that much. The waterproof plywood is recognized as the standard for roofs.

F. C. Horner

H. G. Bursie

The cost of a taxicab body is about 40 per cent of the total cost of the cab. It is not amiss, therefore, to lay due stress on proper body-design and construction. In fact, it is of more importance than the cost proportion.

The keeping of accurate and comparable records by taxicab operators is proving of great value in the improvement of taxicab construction. Every failure of parts is a lesson, and points the way to improvement.

Present conditions can be summarized as follows:

(1) The taxicab field is very far from its saturation point and very little sales resistance is encountered at present
(2) The severe service rendered by the taxicab requires the most durable type of body construction
(3) Proper joining of the frame members is of the utmost importance in producing a serviceable body
(4) The plywood molded roof of the waterproof type is of accepted merit for taxicabs
(5) The body should be of such construction as to allow the easy replacement of parts

Buses Can Help Electric Railways to Give Maximum Service to Public

"THERE is no conflict between the electric railways and the motor vehicle industry. Instead, there is the heartiest cooperation." This was the keynote of the talk made by C. D. Emmons of the United Railway & Electric Co. on "Coordination of the Motorbus and the Street Railway." Each has a distinct sphere of activity, Emmons said, but many cases exist in which destructive competition is taking place. The public will have to decide which medium of transportation it wants in such cases, because both cannot live. Usually there is no conflict, and cooperation is possible. Emmons believes, however, that the motor vehicle can never compete successfully with the street railway when the former is subject to the same regulations and the burdens as the latter. Emmons said in part:

"Many electric railways in the United States are using motor vehicles in connection with their transportation service. On the other hand, many railways are suffering from parasitic competition from unregulated motor vehicles. These railways serve communities that have not yet learned that these two forms of transportation cannot operate in competition with each other without one or the other going broke. It is for the people themselves to decide whether they wish to keep the railways or the motor vehicles.

"I think all sensible men will say that if the motor vehicle will serve a community better and at a lower rate of fare than can be offered by an electric railway, then by all means junk the railway. The fact, however, is that except in very small communities the railway is ever so much cheaper to operate than the motor vehicle.

"In the illuminating, almost prophetic address by Vice-President Elisha Lee of the Pennsylvania Railroad Co. before the Society at the 1923 Annual Dinner, entitled The Motor Truck and Our Railways, I was struck with his remarks on coordination, not competition, and on the needs of the citizenry of this country for the cooperative services of railroads and motor vehicles. His speech will reward re-reading and study.

"This problem of competition between railways and motor vehicles has become very acute in some places. Massachusetts has paid particular attention to it, as have Pennsylvania, Maryland, Connecticut, Rhode Island and other States.

"It almost universally develops that when the motor-vehicle common-carrier is subjected to the same burdens of taxation and to the same regulations that apply to the electric railways, they find it impossible to operate successfully. You are well aware that electric railways in many States are required to carry many extraneous burdens. They have to pay for the paving between the rails and for a distance outside their rails; they have to pay for watering streets, for snow removal; they pay a percentage of their gross income, whether they have any net income or not, in taxes to the state; they pay in many communities a tax on their income to the community; they pay franchise taxes, license fees and various other charges that put a heavy load upon them.

"The motor vehicle that is competing with them, in many communities, has free use of the paving for which the electric railway pays. In many States motor vehicles have not as yet been classified as common carriers; there is no regulation of the rates of fare or charges for carrying freight; in many places they are not under bond, so that if a passenger becomes involved in an accident he has but slight chance to recover damages.

"They do not pay a percentage of their gross income to the State or communities; they do not have to help water the streets. Put upon the motor vehicle the same burden that the railway carries and fares that will permit successful competition with the railways become out of the question."

The case for the motor bus was brought out fully in the discussion of Emmons' paper. R. E. Fielder, Fifth Avenue Coach Co., took issue with some of Emmons' statistics, stating that the traffic survey quoted had been taken over a short period of time and was not typical. He pointed out that no single medium could be expected to handle all the mass transportation and that the bus could not be criticised for failing to do the entire job. Fielder then presented the bus side of the question.

W. P. Kennedy showed the need for cooperation between electric railways and buses and suggested that the electric road undertake the haulage of freight.

F. C. Horner predicted that "in the future surface cars will be entirely eliminated from city streets" and added that the New York trolleys have all the faults of jitneys. He made a plea to the motor interests for support of the efforts of town-planning groups.

Replying briefly to the discussion, Emmons admitted that some of the railways had been backward. He pointed out that buses carrying the same number of people as the street railways are certain to wear out the streets quicker than do cars on rails. Emmons' time for rebuttal was so limited that he could not talk in detail about the various points that had been raised.

Store-Door Delivery Advantages Are Shown by Transport Expert

COORDINATION of motor truck and railroad transportation was urged by W. J. L. Banham, president of the Associated Traffic Clubs of America in his after dinner talk. He brought out the following phases of the problem:

1. The nation's business is hampered by lack of transportation. The public is entitled to prompt transportation by the most suitable method at an economic cost.
2. Main line railroads have sufficient capacity to handle all freight that may be offered.
3. Terminal congestion and complication are the limiting factors.
4. Freight cars and trackage frequently are tied up in less than carload lot transfers and by duties that might be performed more advantageously by the motor truck.
5. The ability of motor trucks to handle practically all less than carload lot short hauls can afford vast relief to the present terminals.
6. Motor trucks can be used for immediate store-front deliveries or pick-ups by the carriers or related companies.

Banham said in part, concerning this matter:

The prevailing practice is to unload less than carload freight from cars into the freight houses and to place carload freight on delivery tracks and then notify the consignee, of the arrival of the goods, by mail. Less than carload shipments remain in the freight houses of the railroads on an average time of three days; carload shipments remain on delivery tracks in excess of two days. A well-organized store-door delivery plan should make the freight house space available for use not less than twice a day, instead of once every three days, thus the capacity of these facilities would be increased six-fold. The capacity of delivery tracks should, under the store-door delivery plan, be increased fourfold.

Speeding Up Transport

Under a proper system and organization, the motor truck should play an important part in speeding up terminal transportation. To do this, however, it would be necessary for the carriers and shippers to agree upon a store-door collection and delivery service, which seems to be the only method whereby freight can be moved to and from freight terminals in the shortest possible time. Store-door delivery will relieve freight congestion and delay and should finally solve the carriers' terminal problem.

It is interesting to note the reasonable teaming charges in Canada, which are made possible by organized teaming under a store-door delivery system. The average cartage rate on carload lots is 4 cents per hundred pounds and the average cartage rate on less than carload lots is less than 6 cents per hundred pounds, which covers delivery to the wholesale and manufacturing districts, a radius of approximately two and one-half miles from the terminals. The same cartage rates prevail on outbound shipments moving from the shippers' warehouses to carriers' terminals.

The motor truck and highways should be used for the handling of short haul freight covering distances up to 25 miles or distances to be agreed upon by both parties. This would relieve the rail carriers of the responsibility of handling short haul freight, which is not only carried at a loss from the viewpoint of the rate, but it also congests their terminals and restricts the use of the carriers' equipment much needed for their long haul traffic.

The movement of less than carload freight between carriers' substations and main stations is also an important problem inasmuch as it involves much expense on the part of the carrier and in many cases the service rendered is unsatisfactory to the public on account of the delay experienced in handling this class of freight by the carrier in what is known as "transfer cars." It would seem that the transfer of this class of freight properly belongs to the facilities offered by the motor trucks, which would eliminate the use of the carriers' equipment for the movement of this class of freight and in elimination thereof both the shippers and the carriers of the country will be greatly benefited.

Moving L. C. L. Freight

The movement of less than carload freight now being handled in trap cars is a further problem which still remains unsolved and when full consideration is given to the rights of the highways and the motor trucks without interfering with the just rights of the rail carriers, the motor truck can and should be used for this special class of service.

The term "trap car" is used to designate a service that is performed free of charge by the railroads for the shipper or consignee with track location on less than carload shipments weighing, or aggregating in weight, 8000 lb. or more.

The railroads also to their advantage should arrange for a more liberal mixing of commercial and railroad brains. I believe that one of the causes which has much to do with the present dissatisfaction on the part of the public is due to the fact that the carriers are trying to solve commercial problems with railroad brains.

We shall not be able to secure the best results from our railroads until the commercial and railroad brains of the country get together.

The proper understanding of the field of the various transportation agencies is vital, but in determining this field each form of transportation should bear its proper responsibilities and charges; no one class of common carriers should be subsidized by the Federal Government or the States to the disadvantage of other competing agencies; and only by mutual understanding of the proper relationships can the good of the public as a whole be advanced, while the encouragement of the active and forced competition would, on the other hand, in the end be destructive.

Rear Axle Test Results Outlined by Von Ammon, Bureau of Standards

THE paper covering an investigation of driving axles for heavy trucks, which was presented by S. von Ammon, gave an outline of tests carried out by the Bureau of Standards in cooperation with the Motor Transport Division of the Quartermaster Corps. The paper dealt in particular with the mechanical efficiency of the axles tested. These included several worm driven Class-B army truck axles with different types of bearings, a number of axles of the internal gear type and others of the multiple reduction type. Each of the axles tested was considered representative of axles in successful use on commercial trucks of five ton rated capacity.

The apparatus used in the tests was of the type described about two years ago in AUTOMOTIVE INDUSTRIES.* It consisted of an electric dynamometer as the driving element. To the dynamometer frame was attached a gearset, which enabled the application of high torque comparable to that sometimes applied in normal service. Power absorption was taken care of by water cooled prony brakes acting on pulleys attached to the rear wheels. The setup of the apparatus is such as to measure the power losses directly rather than to measure input and output and subtract the difference. This method gives much higher accuracy than would otherwise be attained.

It was found possible to separate the losses into so-called no-load losses and load losses, the total loss being the sum of these two.

It was found that the load losses expressed as torque are practically independent of the speed and of the viscosity and the method of applying the lubricant. The losses increased, however, with increase of torque input and at an increasing rate. In the case of the several Class-B worm driven axles, the increase in the load losses with increased torque input was greater than with any of the axles using other types of gearings.

Among the conclusions reached was that a lubricant of lower viscosity at low temperature would improve the mechanical efficiency under the more unfavorable conditions of speed and temperature, and would seem advisable. Such lubricant should, however, be no less efficient than that used in the tests at higher temperatures and the heavy pressures resulting from high torque values. Improvement in the method for circulating the lubricant is sug-

*AUTOMOTIVE INDUSTRIES, April 7, 1921.

gested as desirable. The high no-load losses of some of the axles show that the present method of oil circulation is very inefficient.

The characteristic difference between the worm drive and other forms of gear drive was demonstrated by the greater load losses of the former type. In the worm type the losses are not only greater over the whole range of torque input, but increase more rapidly with increasing torque.

The view is expressed that improvements can probably be made in the worm type axle by greater accuracy in manufacture and possibly by modifications in the material and the design. The report states that there is a question whether in actual service the attention which seems essential for most efficient operation of a heavy duty worm drive can be had.

It is pointed out that the investigation covered only the limited field of heavy duty truck axles of five-ton range capacity, but that the general lessons learned are capable of application to a wider field. A more detailed record of some of the results obtained will probably be published in an early issue of AUTOMOTIVE INDUSTRIES.

Four-Wheel Brake Developments and Balloon Tires Are Discussed

DEVELOPMENT of construction, maintenance and operating methods by the Yellow Taxicab Co. were reviewed in an interesting paper by Paul Geyser, which was presented by R. H. Croninger in Geyser's absence.

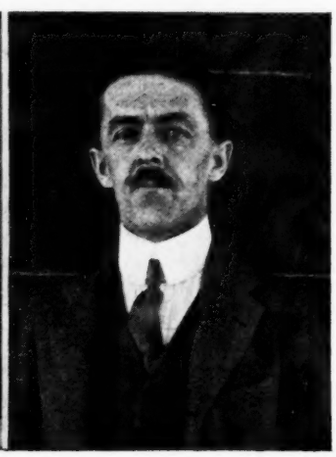
Maintenance work has been studied very closely, times are available for all usual operations, and some remarkable service performance has been made possible. Croninger said, for example, that 20 minutes are allowed for removal of a spring, 40 minutes for taking out a motor and 50 minutes for putting back a motor and getting the cab ready to run.

The lessons learned from the operating company have been incorporated in design from time to time. The present cab is the result of study of operating needs and maintenance costs.

Large section tires and four-wheel brakes got into the limelight when this paper came to be discussed. Croninger did not talk on either of these subjects in detail, but did make certain interesting statements.

Small wheels and large section tires, he said, have been proved highly efficient for taxicab use. A tire with 5-in. section has been found to be most economical from a fuel standpoint.

C. D. Emmons



S. Von Ammon

What is good on a taxicab, Croninger emphasized, may not be the right thing for the touring car. He believes that a 34 x 7-in. tire on a passenger car operating at high speeds might well be a calamity, should the wheel slip into a ditch, as it might well do from a concrete road. Taxicabs, he pointed out, do not operate under high speeds.

Croninger believes that taxicab design and passenger car design are two very different problems and that great care and considerable study should precede any attempt to adapt taxicab practice to passenger car work or vice versa.

Large section tires permit more constant speeds, Croninger stated, by making the car ride more easily. This makes the engine load more constant and thus reduces fuel consumption.

Croninger said the Yellow Cab Co. is experimenting with four-wheel brakes; that it wishes for and would welcome an efficient four-wheel brake system. "Use of four-wheel brakes is absolutely essential," Croninger said. "We think the idea has remarkable merit and wonderful possibilities."

Replying to questions put in discussion, Croninger said that the average fuel consumption of Yellow taxicabs, considering those running under all conditions, is probably about 11.5 m.p.g. He said that window design has been one of the hardest problems encountered, the difficulty being to keep the window tight enough so that it does not rattle and loose enough to open and shut readily. The Yellow company is now developing a constant pressure metal binding that becomes part of the sash. With this device it is hoped the difficulty will be overcome.

R. H. Macy Executive Seeks Truck Built Especially for Retail Work

AUTOMOTIVE engineers can help retailers solve the delivery problem by giving closer and more specific attention to designing a chassis and a body specially fitted for carrying small parcels, said H. B. Wess of R. H. Macy & Co., in his talk on "The Retailer and the Engineer."

Wess does not believe that any real effort has yet been made to build a vehicle specially for the retail field. "I hope I am wrong," he said, "but from my discussions on this subject with men in the field I do not think that a real study has been made of the requirements of the retail field so that a truck can be constructed that is in every respect a retail truck."

Following out this line of thought, Wess continued:

How much study have you really given to the problem of the department store as it applies to the motor vehicle? Can you honestly and truly say that you have built a motor vehicle to fit the needs of the retail field? I know of no other industry that has the problem of house-to-house delivery, where mileage is really a minor factor. I know of no other industry where a certain phase of its delivery equipment is concerned with merchandise, where weight is a small factor. I could continue to mention the particular differences between the retail requirements of the motor vehicle and that of other industries.

Recently, I spoke of the need of placing on a truck a body that is essentially a retail body. Such a body would reduce sorting and loading operations and would assist materially in an efficient delivery. So far, no effort has been made to experiment particularly with a delivery body.

My intention is to appoint an Automotive Construction Committee from among the members of the International Retail Delivery Association, who, because of their particular training along these lines and with the assistance and cooperation of our entire membership, will present to you what they think are the particular requirements of the construction of a light parcel-delivery truck, as well as of a heavier type needed for bulk and furniture deliveries. With your engineering training and application, and your cooperation, so directed, these vehicles should produce results that would cause you to feel that you have assisted the retailer materially in bringing down his expense.

It was suggested to Wess that if he could give some specific idea of type of truck needed for retail delivery, doubtless the engineers could build it for him.

Wess stated that his association was to have a committee to study that very question to get a consensus of experience and needs.

"What's Right with the Truck Industry?"

The essential soundness of the motor truck industry was brought out by S. G. Thompson, White Motor Co., in his paper "What Is Right With the Motor Truck Industry." Thompson's paper was in the nature of a criticism of a recent pamphlet by David Beecroft, the title of which was "What's Wrong With the Motor Truck Industry."

Thompson cited facts and figures to indicate that the truck industry has had a sound growth and that there is a tremendous field for the efficient use of truck transportation. Discussing Thompson's paper, Beecroft emphasized his basic agreement with the statements made and pointed out that the truck industry is passing into a new stage.

The organization which operates the truck is more important to efficient performance, Beecroft said, than the vehicle itself. Operating personnel in general and drivers in particular constitute the most important factors.

Military and Commercial Transport

Major Brainerd Taylor showed the need for the development of truck transport studies in peace time because of their military value in war. He discussed at length the lessons of motor transport learned from the experiences of the allied armies in France. His paper was entitled "Military and Commercial Highway Transport." He also outlined the motor transport organization plan that has been worked out for this country by the Motor Transport Division of the Quartermaster Corps.

Commenting on Taylor's talk, Colonel Stayer said that truck manufacturers are not handling their maintenance properly. He suggested that they give more attention to unit overhaul and unit replacement.

He paid a tribute to trucks in general, saying that all trucks are good trucks if you don't ask them to do something for which they are not designed.

Stayer said that if a truck is properly maintained it costs hardly anything to operate it. "We don't know yet," Stayer said, "how long a truck will keep on going if properly operated and properly maintained."

Principal Defects of Fan Dynamometer Overcome

THE simplest device for the absorption and measurement of the power of internal combustion engines is the so-called fan dynamometer. That it has not come into more extensive use in the automotive industry is due to the fact that in its simplest form it possesses two defects which make it unhandy under certain conditions of use, and are likely to lead to inaccurate results.

The first of these defects resides in the fact that the power absorbed by the device at any particular speed and with the blades in any particular position depends upon the density of the air, which must be obtained from barometric and thermometric observations. The location of the dynamometer relative to walls, etc., also influences the result. The other defect is that changes in load for any given speed cannot be made without first stopping the engine and readjusting the plates.

The first defect was overcome by aircraft engineers during the war by mounting the engine with all its accessories on a cradle supported on ball bearings. The torque of the engine can then be measured directly by means of a platform or spring scale, and variations in atmospheric density need no longer be considered. Attempts have recently been made to also eliminate the second defect—that the engine has to be stopped whenever it is desired to change the torque for a given speed.

The action of the fan dynamometer, of course, consists in setting into motion a certain quantity of air. If the amount of air stirred up by the blades is reduced the resisting couple or torque will be reduced. To this end the fan is enclosed in cylindrical housing closed by two plane end surfaces. In these end walls there are shutters capable of being turned around radial axes. When these shutters are fully open the fan turns practically in free air, as the end walls are then virtually non-existent, and only the cylindrical wall remains to retard air circulation.

Experience with a 12 hp. dynamometer of this type built in France has shown that by leaving the rear wall closed, but opening the front wall, the speed increased from 950 r.p.m. with the housing open to 1470 r.p.m. with the housing closed.

This result is the more interesting because it is possible to use fans of different diameters in the same housing, that is to say, to test engines of different horsepower outputs. The play allowed between the fan plates and the end walls was $\frac{3}{8}$ in. on each side, while that between the outer end of the fan arms and the cylindrical housing was 10 in.

Organizes Soaring Competition

A COMPETITION for light airplanes, something in the nature of soaring planes fitted with small engines, is being organized for September next by the Royal Aero Club. The piston displacement of the engines will be limited to 750 cu. cm. (45.75 cu. in.). It is proposed that the starts shall be made off a hill, and a triangular course not less than 15 miles in length, with a range of hills on one side, is being looked for. A fuel allowance of 1 Imp. gal. will be made and the weight of the pilot must be made up to 168 lbs. if necessary. The Duke of Sunderland, Under Secretary of State for Air, has offered a prize of £500 for the longest flight made in this competition, if over 50 miles.

Analysis of Car Sales in CALIFORNIA Indicates Growing Market

Percentage Gain of Registrations in CALIFORNIA Has Been

1.3 times as great as the percentage gain in number of dealers since 1917

20 times as great as the percentage gain in population since 1915

1.08 times as great as the percentage gain in United States registrations since 1915

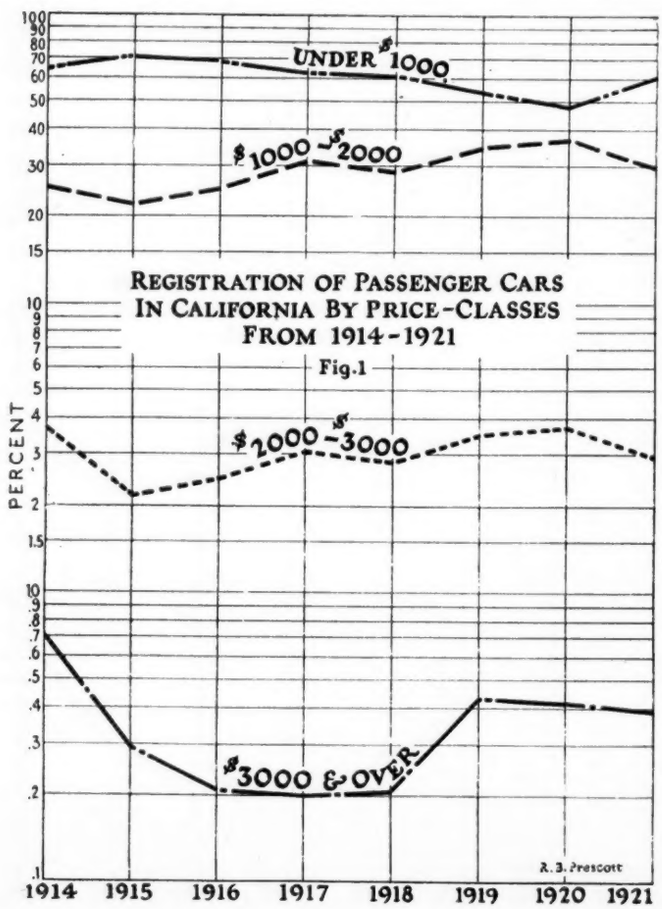
THIS is the second of a series of articles which will give market analysis data for important States. The analysis for New York appeared in Automotive Industries of April 19.

The value of these studies lies chiefly in the presentation of trends. The rate of growth of various factors affecting the market are given in statistical form and the tendencies so developed are discussed in their relation to future sales methods and possibilities.

The next State to be analyzed is Ohio, which had the third largest total registration when the census was taken at the beginning of 1923.

CALIFORNIA registrations will grow faster than California population for ten years or more. The number of cars has increased more rapidly than registrations for the country as a whole since 1915. This indicates a constantly growing market for new cars in the next decade.

More dealers will be needed to realize the full possibilities of the territory, as distances are great and population is not very dense. Increase in the number of dealers has kept pace with registration growth very well in the last six years. This probably accounts for the rapid increase in sales to some extent.



REGISTRATION OF PASSENGER CARS IN CALIFORNIA BY PRICE-CLASSES FROM 1914-1921

Fig. 1

Middle priced cars seem to be a little less popular in California, relatively speaking, than low and high-priced vehicles. Fig. 1 indicates this tendency. While the percentage of "Under $1,000" cars decreased some 12 per cent during the period from 1918 to 1920, it has gone up rather sharply since that time.

While the low-priced curve went down, the other three groups, of course, went up. The "$3,000 and over" group, however, has declined only a very little since 1919, while both the middle-priced groups dropped sharply between 1920 and 1921. Relative movement of the "$2,000-$3,000" and the "$3,000 and over" curves is materially affected, of course, by the price of the Cadillac. This is true in every other State as well as in California. Except for 1920, the low-priced car has maintained a dominant position in the California market. Everybody had money in 1920 and many purchasers bought higher-priced cars who normally would have been prospects only for lower-priced vehicles. Cars selling for less than $1,000 comprised only 49 per cent of the total California registration in that year. The range for other years since 1914 has been between a maximum of 73 per cent and a minimum of 54 per cent. This indicates a greater relative popularity for the low-priced car in California than in New York where the maximum was 65 per cent and the minimum 45 per cent.

Only Six Cars Per Square Mile

Despite tremendous automotive development in California, the State has but six cars for every square mile of area. In 1915 it had only one car per square mile. Nearly every other State, important from an automotive standpoint, has a much greater density of automobile population. New York has 21 cars per square mile; Pennsylvania has 19; Iowa 9; Ohio 22, and Illinois 14.

Road building is being carried forward in California on a large scale. Cross country roads are being developed which will result in increased possibilities for motor transportation. The lack of density in population, the growth of highway mileage and the increasing pros-

perity of the Pacific Coast section combine to make California an excellent future market.

The extent to which dealer growth has kept up with registrations is shown by the fact that in 1917 there were 172 cars per dealer in the State, while there are 202 cars per dealer now. Registrations have increased 1.3 times as fast as dealers in the period mentioned.

Population is growing in California at a rather rapid rate. The gain has been 21 per cent since 1915. This is greater than in Pennsylvania, Ohio, Illinois and some of the other important automobile States. Consequently, new car sales in California will probably continue rather rapidly even after the registration growth curve has straightened out so that it runs about even with the population curve.

The number of persons per car in California has decreased from 18 in 1915 to 4 in 1922. This comparison shows more clearly than any other how much faster registrations have been growing than has population.

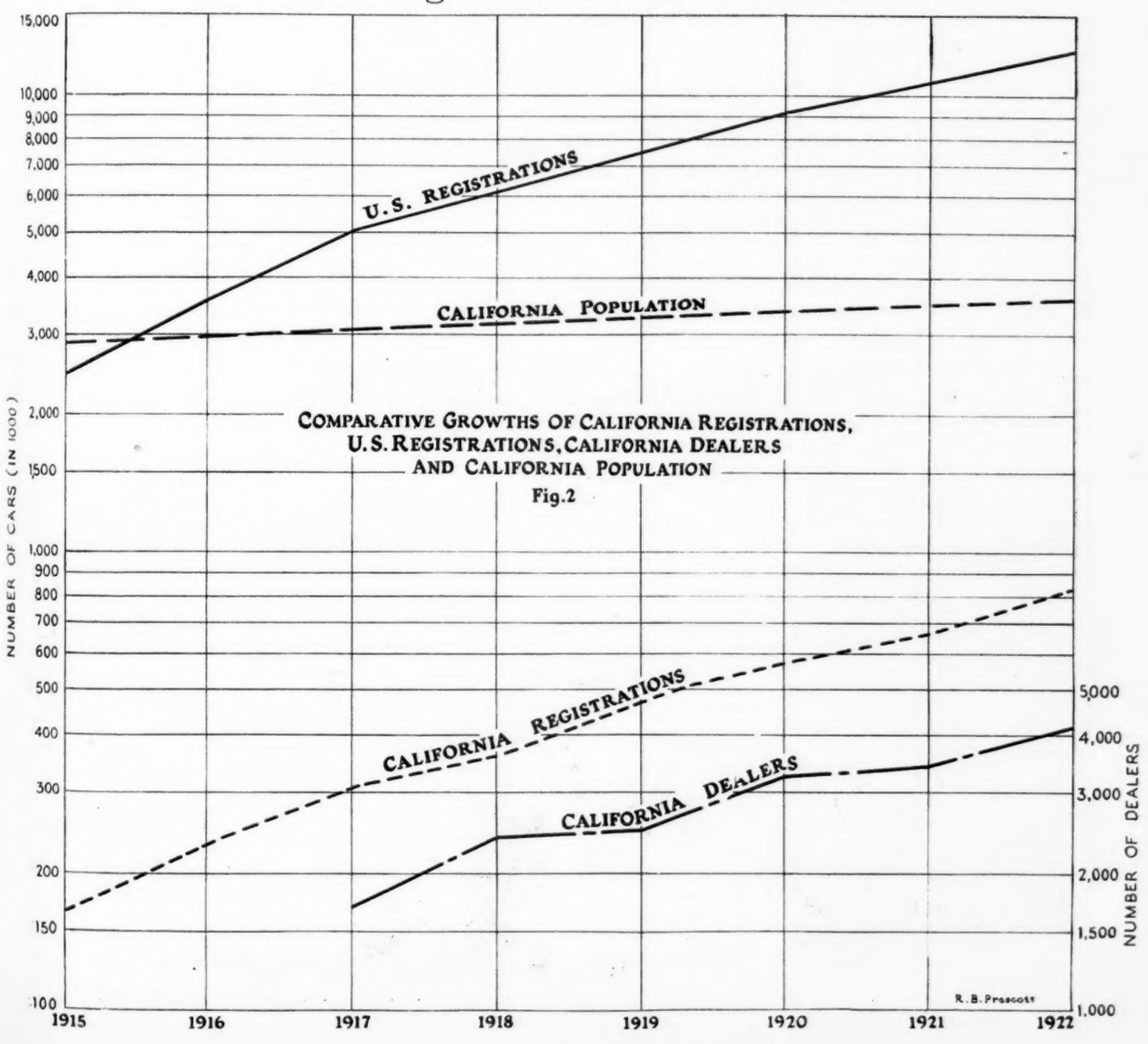
Comparison of the California registration curve with that of the United States as a whole shows that the Golden Gate section comes very close to being an average State. There is a great similarity in the contour of the two curves from 1915 to 1922 as shown in Fig. 2. The California curve is rising just a little faster than that of the United States. The similarity probably is just a coincidence as there is little basis for considering California as typical of the country as a whole in any marketing sense.

The California figures bring out clearly the need for studying sales trends carefully by States. Two States having the same actual car consumption at the present time may have sales trends that are very different. Consequently, different methods of marketing procedure are needed.

The rapidly rising registration and population curves in California indicate that definite efforts are needed to keep dealer organizations numerically strong. The curves indicate a growing market. The distributing agencies to supply that market are provided by dealers. Maximum sales can be realized only if the number of dealers keeps pace with the growth of the market.

The present study, together with one presented in a previous issue showing the Pacific Coast region as a whole, both indicate that the far West will be one of the best sections from a sales standpoint during the next decade.

Marketing Facts About California



COMPARATIVE GROWTHS OF CALIFORNIA REGISTRATIONS, U.S. REGISTRATIONS, CALIFORNIA DEALERS AND CALIFORNIA POPULATION

Fig. 2

New Spur Gear Grinder Generates True Involute Tooth Curve

Also capable of handling reasonable variations. This product of the American Grinder Co. is said to manufacture to very close limits. Can be used for pressure angles up to 25 deg. One cut usually sufficient to produce satisfactory finish.

A SPUR gear grinding machine designed to generate a true involute curve, or any reasonable variation of this curve, has been brought out by the American Grinder Co. The machine is adapted for grinding the teeth of spur gears with pressure angles up to 25 deg. of any diametral pitch from 12 to 3 and of any pitch diameter from 1½ to 8 in., up to 1½ in. face. The American Grinder Co. has recently been incorporated by Albert J. and Conrad L. Ott, formerly of the Ott Grinder Co., which, for the past 5 years, has been active in the development of different gear grinding machines.

The machine is designed for economical production and quick operation. As illustrated in Fig. 1, the control levers are in easy reach of the operator with the heavy and high speed units mounted low and the work arbor with the slow moving carriage above the wheel at suitable loading height. The carriage is actuated by power and the rotatable work spindle is oscillated by thin steel tapes mounted on the outer end of the work spindle where they are accessible. There is an automatic stop to the work carriage; a reversible wheel head which can be set either side of center to the proper grinding angle, centrifugal water pump and removable tank. The machine is self-contained and so designed that it can be driven by a belt direct from the line or countershaft or from a motor located in the base of the machine.

The work arbor locates in a large taper hole in the work spindle which is carried in a sliding carriage that is actuated by a drum cam in the bed of the machine. At the other end of the work spindle, as shown in Fig. 2, is a cylinder of approximately the same diameter as the pitch diameter of the gear to be ground. To the cylinder are attached two pair of thin steel tapes, which are wound around and anchored to the cylinder and also anchored to a rigid bracket, so that as the work carriage slides back and forth, the work spindle is oscillated by the tapes winding and unwinding. This action corresponds to the rolling of a gear in a rack. The rigid bracket to which the tapes are anchored can be adjusted for height to accommodate various sizes of gears and adjustment is provided for the corresponding difference in tape lengths.

Drum Cam Cuts Grinding Time

The drum cam provides a positive reversal of the carriage, eliminating sliding reverse clutches, springs, etc. This design is utilized to cut down the grinding time per tooth by moving the carriage rapidly during the indexing and at a moderate speed when the gear tooth is in mesh with the grinding wheel. Change gears are pro-

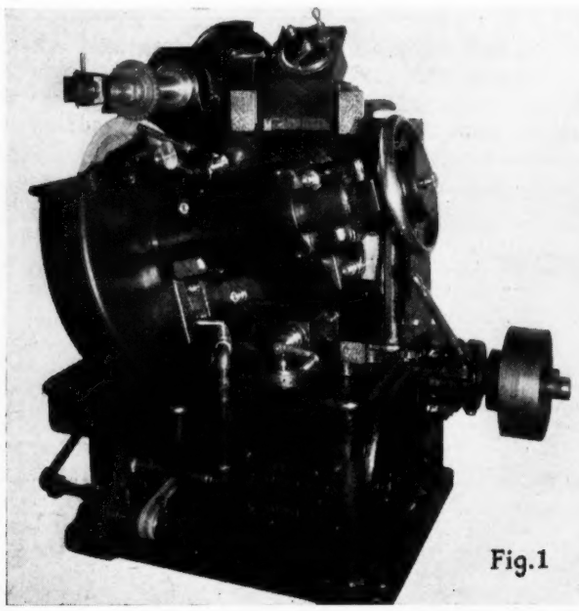


Fig. 1—Front view American gear grinder showing accessible operating levers

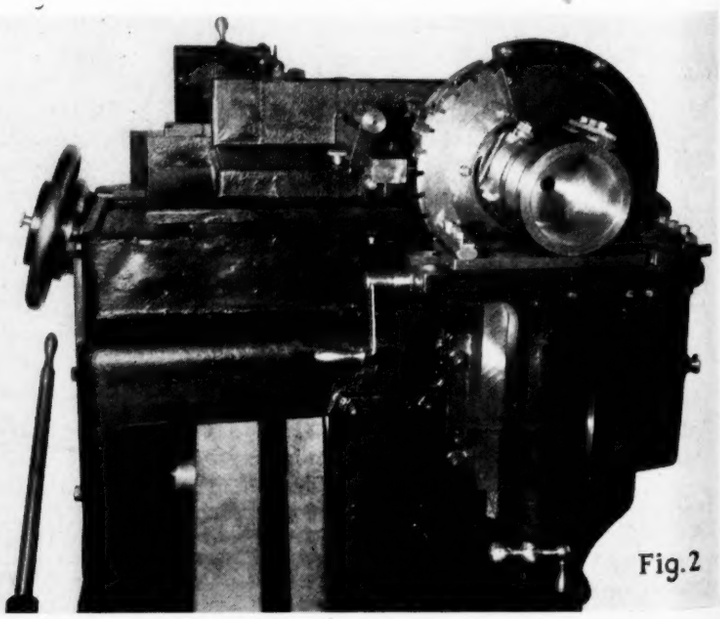


Fig. 2—Indexing and involute curve producing mechanism

vided to grind one side of a gear tooth at the rate of 4, 5 and 6 sec., and means are incorporated within the bed of the machine to change the length of carriage travel and position. The carriage is controlled by the automatic stop mechanism which is located on top of the wheel column, as shown in Fig. 1. This stop can be set to grind from 1 to 60 teeth and after the last tooth is ground, will stop the carriage with the gear free from the grinding wheel and in proper loading position. A device for locating the gear in proper relation to the grinding wheel is provided.

The natural roll of the work spindle is used for indexing the slotted steel disk which controls the spacing of the gear being ground. After the gear has rolled out of the grinding wheel, that is, to the right, as shown in Fig. 1, the cam lifts the index finger out of the index plate slot, as shown in Fig. 2. At the same time, a secondary plunger rides into the same slot and holds the disk until the index finger has traveled on the periphery of the disk to the next slot where it drops in and starts the disk in rotation again while the secondary plunger releases. The plate is ½ in. thick, the index plunger occupies three-fourths of this width, while the secondary occupies the remainder. The entire mechanism runs in a bath of oil. Fig. 2 shows the oil pan and cover removed.

It is claimed that less than 1 sec. is used to index a tooth with this mechanism, and during production grinding gears of 32 teeth, 6-8 pitch, have indicated a total accumulated error of 0.0005 in. over 8 teeth. Stem gears of 16 teeth, 6-8 pitch, have indicated a total accumulated error of 0.0003 in. over 4 teeth.

The grinding wheel is mounted on a 3 in. diameter hardened, ground and lapped alloy steel spindle. The spindle bearings are of Lumen bronze, tapered on the outside for adjustment. Horizontal adjustment of the wheel is controlled by a hand wheel graduated in thousandths of an inch. A positive wheel stop and worm driven wheel truing device is provided. The wheel head pad is equipped with an elevating mechanism and the wheel head can be swiveled either side of center to any angle up to 25 deg. The average spur gear can be reversed in order to grind both sides of the teeth, but in the case of a gear that is integral with the shaft, or any gear that cannot be reversed, the same result can be obtained by swiveling the wheel head in the opposite direction and reversing the grinding wheel.

One grinding cut is generally sufficient, according to the manufacturers, to produce a satisfactory finish in the case of the average gear. Where bad distortion exists two cuts are necessary. When two cuts are taken from 0.003 to 0.005 in. is removed in the first cut and 0.001 in. in the second cut. The heaviest cut that has been attempted on this machine was taken on a 32 tooth, 6-8 in. pitch, ¾ in. face, case hardened gear. This cut was 0.010 in. on all teeth, with the grinding time of 3 min.; there was no burning. The wheel used was a Norton No. 6636 combination J. The wheel is shown in Fig. 3. It is claimed that with careful truing the wheel should grind over 1000 gears of 32 teeth.

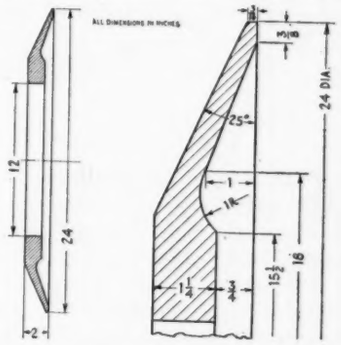
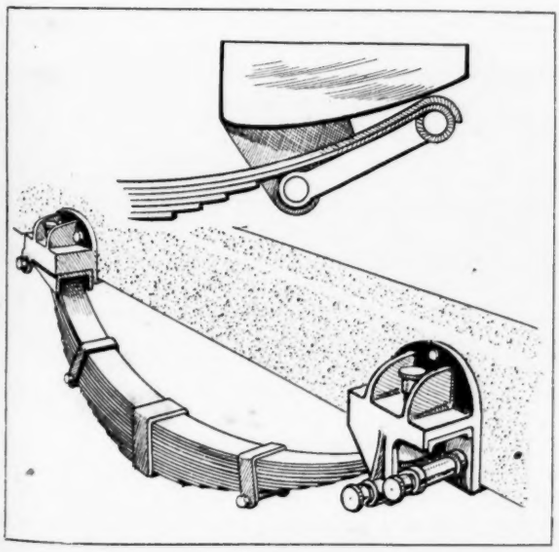


Fig. 3—Cross section of grinding wheel

British Truck Features Variable Length Springs

UNUSUAL spring construction features the new two-ton truck model recently introduced by the Bristol Tramways Co., a well-known British concern which has concentrated in the past on three and four-ton models.



The semi-elliptic rear springs have front and rear anchorages rendering them stiffer with increasing load, and vice versa. The rear ends of the springs—themselves of almost normal design—are anchored to shackle plates as usual, though the plates project rearwardly at an angle of approximately 30 deg. from the horizontal instead of being almost vertical with "no load."

Above each spring end the frame bracket has attached to its underneath surface an inverted curved slipper which, as the spring becomes deflected with increased load, forms an abutment for the end of the top leaf, progressively shortening the effective length of the spring.

The shackle plates merely serve to locate the springs, for the latter come into contact with the slipper almost immediately the first portion of the load is put aboard. The slipper is separate from the actual bracket, being of case-hardened steel and renewable. Grease cups are provided for the contact surfaces of slipper and spring as well as for the shackle pins. At the front ends the slippers also appear though the shackles are absent.

The accompanying sketch and diagrammatic inset show this scheme, which, while of benefit with quarter and half loads of merchandise, especially fragile goods, shows to greatest advantage in connection with passenger transport.

Corn Belt Farmers Think Poor Roads Chief Handicap to Truck Use

Survey conducted by Department of Agriculture reveals cost of operation a secondary consideration. Saving of time reported as principal advantage. New markets reached. Eighty-five per cent of owners to replace equipment when worn out.

A SURVEY of motor truck use on corn belt farms conducted by the Department of Agriculture, shows that the principal disadvantages to truck operation in 1922 were poor roads and cost of operation.

Cost of operation evidently was considered a greater disadvantage by truck owners in 1922 than in 1920. Doubtless this was due in part to the fact that in 1922 costs of repairs, fuel and oil were higher with respect to the prices of farm products than they were in the previous year.

The study was conducted by H. R. Tolley, agricultural engineer and L. M. Church, assistant agricultural engineer, who sent questionnaires to more than 1000 farm truck owners in Illinois, Indiana, Iowa, eastern Kansas, southern Minnesota, Missouri, eastern Nebraska, southeastern South Dakota, and southern Wisconsin. Each of these truck owners reported the size and type of his farm, the size of his motor truck, length of time he had owned it, use which he was making of it, the cost of operating it, and other related information.

The average first cost of trucks of different sizes, including extra equipment purchased for use with them, was as follows: ¾-ton trucks, $1,486; for 1-ton trucks, $987; for 1½-ton trucks, $1,943; for 2-ton trucks, $2,115.

Often the quoted price of a truck does not include some equipment which it is necessary or desirable to have, and about two-thirds of the men reporting had purchased some such equipment. This varied from minor attachments, costing only $2 to $3, to cabs and bodies costing several hundred dollars. It must also be remembered that practically all of these trucks were purchased in 1917, 1918, or 1919, and that the price of motor trucks in general was at that time higher than the prices which prevailed in June, 1922.

Estimated Life of Truck Models

The average life of these trucks, as estimated in 1922 by their owners, is 8.4 years. The estimated life of the ¾-ton trucks is 7.9 years, 1-ton trucks 8.3 years, 1½-ton trucks 9 years, and 2-ton trucks 8.3 years.

The estimate of the life of a truck depends not only upon the probable amount of work which it will do and the care which it will be given, but also upon the owner's idea as to when it will be cheaper to discard it and purchase a new one than to spend more time and money on it for repairs. There is quite a wide variation in the individual estimates on this item, but the averages will give the prospective purchaser a fairly definite idea of the amount of service he may expect from a truck.

The average first cost of the trucks of different sizes divided by the average life gives an annual depreciation of 188 for the ¾-ton ton trucks, $119 for the 1-ton trucks, 216 for the 1½-ton trucks, and $255 for the 2-ton trucks. The annual depreciation divided by the average number of miles traveled per year gives a depreciation charge per mile of travel of 6.8 cents for the ¾-ton trucks, 6.5 cents for the 1-ton trucks, 10.2 cents for the 1½-ton trucks, and 12.5 cents for the 2-ton trucks.

The depreciation per year and per mile varies greatly for individual trucks, but these average figures at least show the importance of this item. For each size the depreciation charge as here given is greater than the combined costs of fuel, oil, and tires.

Wide Variation in Repair Costs

The repair costs vary greatly with individual trucks, but the prospective owner will desire to know something as to what he must expect. Repairs will ordinarily be low for the first year or two of the truck's life. Of the men who furnished reports in both 1920 and 1922, 472 gave on their first reports the amount which they had spent up to that time for repairs, and 431 gave on their second report in 1922 the amount which they had spent up to that time for repairs.

Of the 472 reporting in 1920, 100 had owned their trucks 6 months or less, and 68 of the 100 had spent nothing for repairs, while the average cost of repairs for the 32 had been about $13; 166 had owned their machines from 7 to 12 months, and 92 had no repairs, while the average cost for the 74 had been about $13; 184 had owned their machines 13 to 24 months, and 40 had no expense for repairs, while the average cost for the 144 had been about $29; 22 had owned their machines 25 months or more, and as all had spent something for repairs the average cost was about $33.

At the time the 1922 reports were made, all of the trucks had been in use more than two years. Of the 431 who reported their repair costs at that time, 246 had owned their trucks 25 to 36 months, and the average repair cost from the time of purchase had been $47; 160 men had owned their trucks 37 to 48 months, and the average repair cost from the time of purchase had been $80; 25 men had owned their trucks more than 48 months, and the average repair cost had been $82.

There were wide variations in the repair costs of individual trucks of the same size and age, but in general it is to be expected that the repair costs will be higher for the larger trucks, and that they will increase as the trucks become older.

On the average, the trucks which had been in use between 3 and 4 years, with an average total repair cost of $80 had an average annual repair cost of approximately $25, but it is evident that the average annual repair cost for the entire life of these trucks would be

higher. In the absence of more accurate figures, allowances of $75 per year for the ¾-ton trucks, $75 for the 1-ton trucks, $100 for the 1½-ton trucks, and $150 for the 2-ton trucks have been made as fair charges for the average annual repair costs in figuring the cost of operation.

The average number of miles per gallon of gasoline obtained by men who own trucks of different sizes is about 11.2 miles for the ¾-ton, 10.5 miles for the 1-ton, 9.1 miles for the 1½-ton, and 7.9 miles for the 2-ton models. There is practically no difference between the 1920 and 1922 reports as to the average number of miles per gallon of fuel for the different sizes. The average number of miles per quart of lubricating oil for the machines of different sizes as reported in 1920 was 80 miles for the ¾-ton, 46 miles for the 1-ton, 52 miles for the 1½-ton, 38 miles for the 2-ton trucks. Since lubricating oil is one of the minor items of expense, the owners were not asked to report concerning it in 1922.

In 1922, 93 per cent of the owners reported that the saving of time was the principal advantage, and in 1920, 90 per cent of the same owners gave the same reply. There are other advantages, of course, but evidently this is the principal one in the minds of truck owners. Very few report that the principal advantage of the truck is that it enables them to go to a better market, but 33 per cent of the total number now use other markets than before the purchase of their trucks. Going to a market which is farther from the farm is simply a matter of taking more time for marketing, and a considerable number of the men who say that saving of time is the principal advantage find that the truck saves them sufficient time to enable them to go to the better market. Reducing shrinkage when marketing live stock, which is often mentioned as one of the big advantages of a motor truck, is also largely a matter of reducing the time required for getting the stock from farm to market.

	Size of Truck			
Fixed charges:	¾-ton	1-ton	1½-ton	2-ton
Annual depreciation	$188	$119	$216	$255
Annual repairs	75	75	100	150
Annual interest	67	44	86	95
Annual registration and license fees	12	14	19	25
Total fixed charges	342	252	421	525
Miles traveled per year	2,765	1,820	2,111	2,035
Fixed charges per mile	$0.124	$0.138	$0.199	$0.258
Gasoline and oil per mile	.022	.025	.027	.032
Tires per mile	.021	.012	.015	.024
Total cost per mile	.167	.175	.241	.314

Time Saving Paramount

That such a small number consider other factors, such as the saving of horses, the reducing of expense, and added convenience, as the principal advantages of the truck, indicates that the amount of time which the motor truck will save, which may incidentally result in reaching a better market or getting live stock and crops to market in better condition, is the item which should be given paramount importance when considering the purchase of a motor truck.

As to the greatest disadvantage, in 1922, 58 per cent reported "poor roads"; 18 per cent "cost of operation"; and 9 per cent "first cost of the truck." Very few reported any other single item as the greatest disadvantage. In 1920, 54 per cent of these same men reported "poor roads"; 8 per cent "cost of operation"; and 8 per cent "first cost of the truck."

The method of conducting the investigation was such that it was not possible to determine the extent to which the use of motor trucks had changed the incomes of these men, but each one was asked the question "Do you believe this truck has been a profitable investment?" Each of the owners undoubtedly expected when he purchased his truck that it would prove a profitable investment, and the replies to this question should at least show the extent to which the trucks have not come up to the expectations of their owners. In all, 81 per cent of the men reporting in 1922 stated that they believed their trucks would prove profitable. A summary of the replies of the same men in 1920, two years earlier, showed that at that time 91 per cent believed their trucks would prove profitable.

Majority Think Truck Profitable

That some of these men had changed their opinions during the two years between the reports was probably due both to the fact that as the trucks became older the cost of operating some of them had increased unduly, and furthermore that economic conditions in 1922 were not as favorable to the use of motor trucks as they were in 1920 and earlier.

The size of the trucks evidently had something to do with their owners' opinions as to their profitableness. In 1922, 84 per cent of the owners of the 1-ton and smaller sizes, and only 68 per cent of the owners of trucks of larger sizes believed their machines would prove profitable. In 1920, 92 per cent of the owners of the 1-ton and smaller sizes and 84 per cent of the owners of the larger sizes believed their trucks would prove profitable.

Practically all of these men, however, expected to continue to use their machines even though they did not believe they were proving profitable, 98 per cent of the 508 men who still owned their original trucks having stated that they expected to use them during 1922. In reply to the question as to whether they intended to buy others when their present machines are worn out, 85 per cent gave affirmative answers.

Oxidized Kerosene Gives Promise

ACCORDING to a report by Dr. J. H. James, head of the Department of Chemical Engineering of the Carnegie Institute of Technology, oxidized kerosenes cause less "knocking" than straight kerosene when used in a kerosene engine.

His test also shows that oxidized kerosene generates approximately the same power as ordinary kerosene, in spite of the fact that its theoretical thermal value is one-eighth less. Dr. James attributes this high efficiency to the more complete combustion attained by these partly oxidized fuels.

The success of this experimental work gives promise that oxidized kerosene, which is manufactured by catalytic oxidation from low-grade petroleum, may become a useful fuel for kerosene engines or for blending with gasoline.

Chill Castings Without Porous Cores Can Be Made From "Y" Metal

Light Alloys Research Committee of British National Physical Laboratory gives results of new experimental work. Now able to make chill-cast rods which regularly have tensile strength of 45,000 lb. per sq. in. and elongation of 14 per cent in 2 in.

FURTHER investigations have been made at the National Physical Laboratory of England in connection with the so-called "Y" alloy of aluminum, which in the original 1921 report of the Light Alloys Research Committee was designated as the most suitable alloy for explosion engine pistons.

The results of this latest research, which relate to the properties of chill-cast samples of the alloy, are embodied in a paper by W. Rosenhain, S. L. Archbutt and S. A. E. Wells, all connected with the National Physical Laboratory, which was presented to the Institute of Metals at its recent meeting. The "Y" alloy, it may be recalled, contains, besides aluminum, 4 per cent of copper, 2 per cent of nickel and 1.5 per cent of magnesium. Pistons of aluminum alloys are often cast in metal molds and are then chill-cast, hence the importance of the subject to the automotive industry.

In the past, heat treated, chill cast rods of "Y" alloy had been found to give tensile strengths of 47,000 lb. per sq. in., combined with an elongation of 5 to 6 per cent in 2 in. Unfortunately, experience showed that these highly satisfactory results could not be obtained regularly. Without any marked difference in the composition of the alloy or the method of heat treatment, the ultimate strength sometimes was as low as 30,000 lb. per sq. in.

In an endeavor to eliminate this irregularity a series of experiments on 1-in. diameter chill castings was carried out. The results of these experiments are considered to have been very satisfactory, and it is said to be possible now to prepare chill-cast rods of this alloy which regularly give values of tensile strength exceeding 45,000 lb. per sq. in. In one remarkable instance a strength of 52,000 lb. per sq. in., combined with an elongation of 14 per cent in 2 in., was obtained.

The view is expressed by the authors that the experimental work not only resulted in the improvement of the "Y" alloy in the form of chill castings, but threw considerable light upon the factors which influence the strength properties of chill castings in general.

Determining Unsoundness Through Density

A ready means of determining unsoundness in a cast bar consists in determining the density. Tests were made upon cylindrical bars of 1 in. diameter by 6 in. long. It was found that when such test pieces were turned down in the lathe, the apparent density of the whole piece diminished with the removal of successive layers.

Experience with bars of other alloys cast in chills indicated that the cause of unsoundness at the center of the bar lies in the formation of an unduly deep ring of radial or "chill" crystals starting from the surface of contact with the mold. Where these radial crystals are developed to an excessive extent, there is always a considerable tendency to the formation of cavities at the center of the bar.

The manner in which the formation of an undue depth of chill crystals could be avoided was studied, and it appeared at once that the governing factor is the amount of chill given to the metal in immediate contact with the mold. This, in turn, depends upon the heat capacity of the mold, and is governed both by the temperature of the mold and by its mass, specific heat and thermal conductivity. With a given material of mold and the mold temperature fixed by other considerations, the depth of chill can be influenced only by the cross sectional area of the mold, and attention was therefore given to determining the best ratio of cross-sectional area of mold to casting.

Preventing Contraction Cavity Formation

When a heavy cast iron mold is used, while the layer of metal in contact with the mold is rapidly chilled and solidified, the rate of solidification of the metal in the center of the casting is much slower, and this shows itself by excessive "piping." Even when the rate of pouring is so controlled that a minimum amount of molten metal is at any time in the mold, this cannot entirely overcome the effect of the chilling of the outer surface. Although a certain amount of improvement can be effected by the subsequent addition of molten metal during solidification ("following up"), it is not possible by this means entirely to prevent the formation of contraction cavities.

A certain amount of improvement can also be made by increasing the temperature of the mold, and this is particularly effective in the case of aluminum alloys, when the temperature of the mold can, if necessary, be raised nearly to that of the freezing point of the alloy. Too high a mold temperature, on the other hand, is almost as bad as too low a temperature. The mold temperature, therefore, becomes fixed by a consideration of the quality of the surface produced on the casting, and the regulation of the amount of chilling can best be effected by varying the mass of the mold itself.

It was found that by a proper proportioning of the cross-sectional area of the mold to the cross-sectional area of the casting, and careful control of casting conditions, it is possible to eliminate a marked difference in density between the outside and the center of the chill-cast rods, and to bring the density even of the cen-

tral core of the cast rod to a value closely approaching that of the alloy in the wrought condition (2.80).

The conditions which have been found to give the best results are as follows:

(*a*) The ratio of cross-sectional area of mold (gray cast iron) to that of the casting to be 3:1.
(*b*) The mold, dressed with a thick paste of plumbago and lubricating oil applied in a thin film, to be heated to 150 deg. to 200 deg. C. and used tilted to an angle of 30 deg. to the vertical.
(*c*) The temperature of the alloy in the crucible during melting not to exceed 800 deg. C.
(*d*) The molten alloy to be poured at 750 deg. C. in a slow stream, striking the mold as near the top as possible to avoid the danger of a "hot spot."
(*e*) The time taken to fill the mold 7 in. deep by 1 in. diameter to be not less than ten seconds.

Rods cast in accordance with the above conditions show tensile strength in the neighborhood of 45,000 lb. per sq. in. and from 5 to 6 per cent extension in 2 in. If their density is satisfactory, such results can be regularly relied upon after proper heat-treatment.

In the case of one particular rod, which in the form of a roughed-out test-piece was found to have a density of 2.789, the following remarkable tensile test results were obtained after heat-treatment:

Yield stress .....38,000 lb. per sq. in.
Maximum stress .....52,000 lb. per sq. in.
Extension on 2 in.....14 per cent
Reduction of area.....15 per cent

2. No change in density has been observed to result from heat-treatment.

3. No advantage has been obtained in the case of this alloy by the employment of graphite molds in place of cast iron ones.

4. The resistance to alternating stresses (fatigue range) of these alloys has been determined, and it has been found that cast heat-treated rod will withstand twelve million reversals of a maximum fiber stress of 15,700 lb. per sq. in. The test results indicate a safe fatigue range of ± 15,900 lb. per sq. in. This result is considerably superior to any values which have hitherto been obtained from cast aluminum alloys.

1. The use of temperatures exceeding 525 deg. C. during heat-treatment in a salt bath has been found to cause blisters to form on the surfaces of castings. Excellent results have, however, been obtained from tensile tests of test-pieces machined from blistered rods.

2. At a temperature of 520 deg. ± 5 deg. C., six hours is a sufficiently long period of heating.

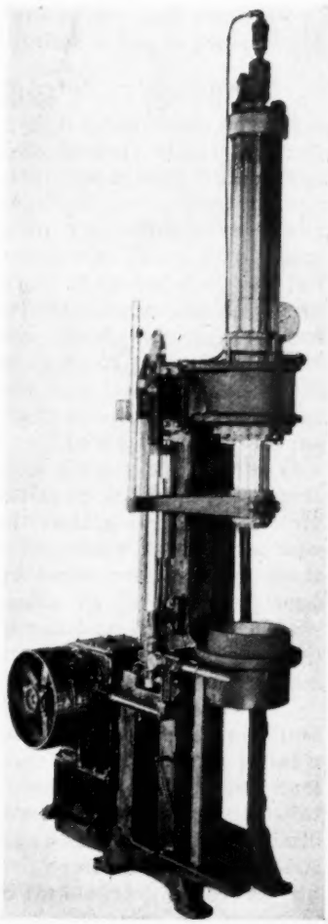
3. The plunging of the cast rods at normal temperature directly into the salt bath at 520 deg. C. has been found to be perfectly safe and free from danger of causing cracking. Similar remarks apply to the quenching operation after heating at 520 deg. C. in boiling water.

Places Gooseneck Broaching and Assembling Press on Market

THE new gooseneck broaching and assembling press manufactured by the Oilgear Co. is operated hydraulically by an Oilgear variable delivery pump. The ram control is claimed to be flexible and accurate, and the push steady. The ram speed may be changed either automatically or manually at any point of the stroke. The press is adapted both for use in broaching and in assembling work such as forcing bushings into bearings. Higher speeds are said to be possible than usually employed in this class of work.

The press is arranged for stopping the ram automatically at the end of the stroke and returning it automatically to the starting position, ready for the next cycle. The operator starts the ram on its downward stroke by pressing either the hand or foot lever.

The automatic action is taken care of by means of an adjustable trip and a tappet. Attached to the ram is an arm on which is mounted the rod which carries the trip. At the end of the stroke the trip releases the tappet, permits a control rod to be operated by a helical spring and thus reverses the ram and returns it to the starting position. A collar on the trip rod engages with a stop on the control rod and stops the ram in the correct position.



Oilgear gooseneck broaching and assembling press

By adding a second trip and a second tappet, a rapid advance stroke can be made to precede the working stroke, the ram speed being automatically slowed down to the selected pressing speed at the point at which the working stroke begins. The lengths of the rapid advance stroke and the working stroke can be changed to suit the work in hand.

The new Oilgear broaching press is built in four sizes—3½ tons, 6 tons, 10 tons and 14 tons. The cylinder diameters vary from 3 to 6 inches; the ram diameters from 2 3/8 to 4¾ inches. It is claimed that one of these presses, recently installed in an automobile plant, is turning out from 600 to 650 pieces per day of nine hours. The work consists of broaching a 1-in. square hole in windshield posts. Two broaches are used.

Good Home Trade for Germany

ACCORDING to a report of the secretary of the German Automobile Dealers Association, the home market for autombiles in Germany during the past year was very good, notwithstanding the enormous price increases (in marks). Purchasers consisted chiefly of three classes viz.—Foreigners living in Germany or temporarily there; commercial enterprises in which are engaged a great many of the newly rich and owners of country estates.

It is stated that doctors, who formerly constituted an important class of automobile buyers, have practically ceased to count as such, as they have almost without exception returned to the motorcycle or even the pedal cycle.

Testing Machine Developed to Solve Gear Strength Problem

Designed for use in determining the increment load due to speed. Will establish relationship between this load on one hand and tooth form errors and mechanical properties of material on the other. Permits study of endurance and efficiency.

By Wilfred Lewis*

ABOUT thirty years ago, the writer made an investigation of the strength of gear teeth based upon tooth forms in common use, and formulated the working strength in terms of pitch, face, number of teeth and working stress. This investigation was theoretical rather than experimental in character, and in the application of the formulas developed, the engineer was expected to use his own judgment as to the safe working stress allowable in any given case. As a guide, however, to keep him within reasonable bounds, 8000 lb. per sq. in. was suggested as a safe working limit for cast iron and 20,000 lb. for steel.

These stresses referred to static conditions or to gears running at a low speed without shock, and it was recognized that the safe working load was related in some way to the perfection attained in forming and spacing the teeth, and to the speed. However, no attempt was made to establish this relation, and the matter was left for future determination, after citing Walker's rules published in 1868, as the best to be found on the subject.

How his speed factors were obtained does not appear, but it is fair to assume that they were determined with considerable care from observations or experiments, and it is interesting to note their agreement in form with the

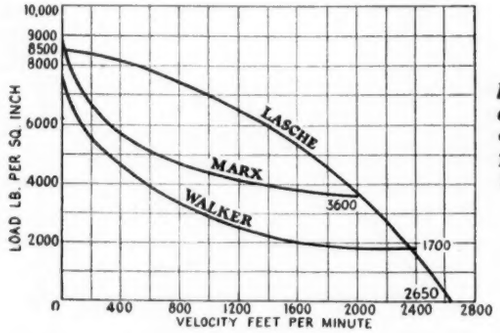


Fig. 1—Variation of load carrying capacity with pitch line velocity

results obtained by Professor Marx in his elaborate and carefully made experiments reported to the A. S. M. E., in 1912 and 1915, as shown by Fig. 1. Both curves of strength are convex to the base line and approach it as an asymptote with increasing speed.

But, it is difficult to reconcile these results with the analytical work of Oscar Lasche of Berlin, published in 1899, which appears to have escaped the attention it deserved until translated and emphasized by Daniel Adamson in 1916. While recognizing the importance of the part played by resilience in iron and steel and the somewhat plastic deformations in such materials as rawhide and hard wood, in absorbing shock and reducing the increment load arising from irregularities in forming and spacing the teeth, he pointed to the tremendous influence of velocity on the detrimental effects of errors in pitch or form and showed that rigid forms in rolling contact would cause increment loads proportional to the speed-squared.

From this point of view the curve of strength as affected by speed becomes a parabola focused in the axis of ordinates, and such a curve (Fig 1) can be made to run very close to the extreme values as plotted for Walker and Marx, but instead of dropping rapidly at first and showing smaller losses thereafter for equal gains in speed, the Lasche curve of strength has an entirely different character, being a curve wholly concave to the base line and plunging across it in a way which would seem to put a definite limit to the speed.

Speed Causes No Appreciable Strength Loss

On the other hand it is pretty clear that if gear teeth were perfectly formed and spaced, there would be no appreciable loss in strength from speed, and yet 30 years ago the writer was rash enough to presume that there might be a difference of two to one, representing the usual difference between a live load and a dead load. But that was before the advent of automobiles with their highly elastic pneumatic tires, which show on a smooth road a uniform elastic compression quite independent of speed, and make clear the difference between a suddenly applied load and one that is simply transferred as it might be in perfect gearing from one tooth to another without shock.

Generated gear teeth were then unknown and it is not surprising that the results obtained by Professor Marx are so much higher than those given by Walker so many years ago, but in view of the wide divergence between these results and those indicated for momentum, the question may well be asked how they can be reconciled with each other, and the answer seems to call for further investigation in the hope that a new gear tester may shed some light upon it.

In the writer's opinion, breaking tests are misleading and should be discouraged for the simple reason that when a gear is broken under any given conditions as to load and speed, it is done for, and it becomes impossible to say what that gear would have shown under some other conditions. So, also, in regard to forming and spacing, it is a matter of vital importance that the minute errors, so detrimental to smooth running, be noted in terms of the velocity ratios which they produce, and as near as may be under actual working conditions.

But, if it be true, and no doubt it is, that errors in

*Paper read before the American Gear Manufacturers Association meeting. SHghtly condensed.

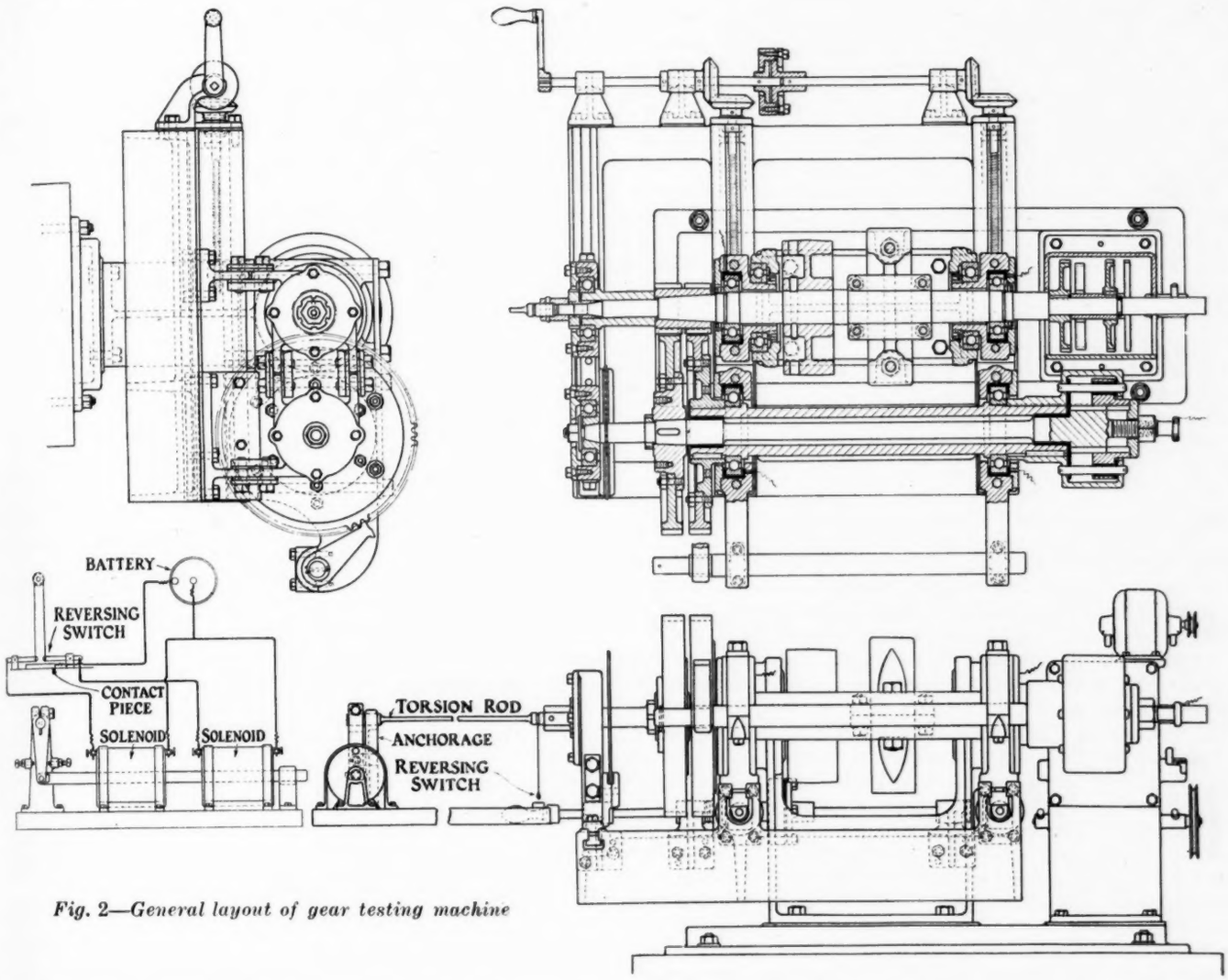


Fig. 2—General layout of gear testing machine

forming and spacing are responsible for the loss of working strength in gear teeth at speed, and that, as pointed out by Lasche, the variations in velocity ratios caused thereby, give increment loads proportional to the speed squared for rigid forms in continuous rolling contact, a complete understanding of the effect of speed upon the strength of gear teeth requires a correlation of errors to the increment load or to the permissible speed as indicated by Adamson in the paper referred to.

Originally, the writer believed that the only way to ascertain the effect of speed upon strength was to run gears to destruction on the lines followed by Prof. Marx, and in view of the difficulties attending the use of power sufficient to break heavy gears at high speeds, he was tempted to design the gear tester shown and described in the Transactions of the A. S. M. E. for 1914, and afterwards built for the University of Illinois in 1916. This was also intended to determine the efficiency and breaking strength of gear teeth under various loads and speeds, but the war intervened and nothing has as yet been reported from its use.

Lasche Principle Revived

Here again the principle announced by Lasche was overlooked, and it was not until the summer of 1920 that the writer's interest was revived by a communication from Chas. H. Logue, to which attention is called, as the first step forward in the application of Lasche's principle since its importance was emphasized by Adamson in 1916.

Logue proposed to produce mechanical diagrams showing in a magnified way the irregularities in velocity ratio for a pair of engaging gears, and from these diagrams to calculate the force of acceleration causing an increment load, which when deducted from the allowable static load, would give the allowable safe load at any speed.

A pair of gears were mounted in bearings and a pair of disks on the gear shaft were connected by a wire, the tension in which caused pressure between the gear teeth. The disks, of course, bore the same relation to each other as the pitch circles of the gears, and, as they turned with the teeth in action, irregularities in velocity ratio would cause more or less slack in the connecting wire, which was multiplied by an index finger. Readings were taken at successive points in the arc of action and the variations in velocity were noted as the data needed in connection with mass to determine the increment load at any speed. This apparatus was modified and improved to give indicator diagrams on paper ribbons or on disks in a closed curve from which the increment load was calculated, and at the suggestion of Adamson,

Logue very freely laid the whole matter before the writer to discover if possible whether the gear tester above referred to could be utilized in connection with his problem. So far as the diagrams were concerned, it occurred to the writer at once that the gear tester was admirably adapted to their accurate production under conditions that could not be realized so well with any

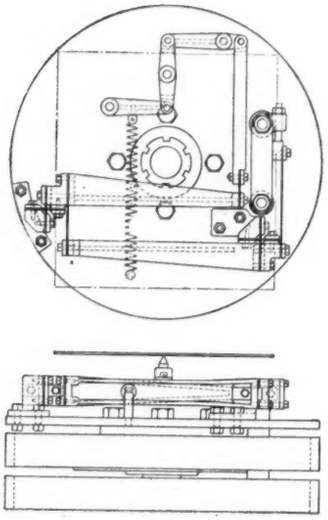


Fig. 3—Lever multiplying and recording mechanism

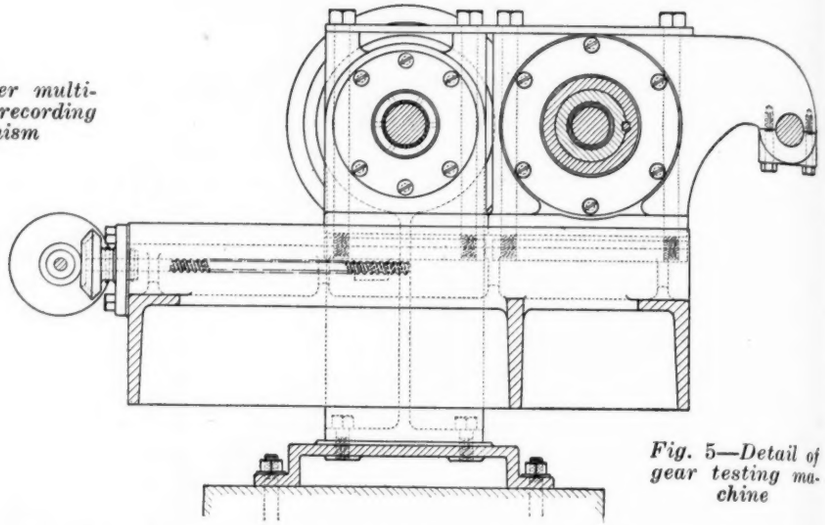


Fig. 5—Detail of gear testing machine

other form of apparatus, but it took all summer to observe that the same machine was equally available for the direct determination of decrement loads rather than increment loads and that it might be materially simplified without detriment as a means for determining the effect of speed upon the strength of gear teeth.

Referring to Fig. 2, the new gear-tester is shown to consist of a wide-faced pinion mounted in bearings on a swing frame which carries a pair of test gears in telescoped shafts, the outer ends of which can be twisted and held in place by a powerful screw adjustment. This differs from the machine proposed in December last, by the addition of outer bearings suggested to Ralph E. Flanders by Professor Magruder of the Ohio State University, and they constitute a very important improvement in the machine. The swing frame is extended as an anchorage for these bearings and it now consists of a cross ribbed casting with three parallel slots, two of which carry the main bearings and one the outer bearings, all of which are securely clamped in position before the initial load is applied.

Swing Frames Carried on Bearings

The swing frame is carried on two Hess-Bright bearings with 1 in. balls in a fixed stand centered on the pinion shaft, and parallel with this, at a convenient distance, determined by the sizes of the engaging gears, is a heavy round bar resting upon portable platform scales. A pawl on the projecting end of this bar can be engaged with either or both of the test gears and when so engaged the initial load can be adjusted by a nut on the outer end of the central shaft through an intervening nut of very long pitch, mounted on the same shaft and engaging by insulated pin connections the telescopic sleeve. When an initial load has been applied in this way, it can be accurately measured by the supporting scales, as will appear later on. In this way the load on the teeth is made to act equally in opposite directions upon the wide-faced pinion, but when running, there will be a slight difference in pressure on the test gears which measures the friction loss as shown by the scale readings.

The pinion shaft, 3 in. diam., is carried in three Hess-Bright ball bearings with 15/16 in. balls, and the driving pinion runs between two of these, pinched on a conical surface to avoid the use of keys and make changes easy. The pinion shaft may be driven by the heavy belt pulley securely attached or by motor coupled direct, as will presently appear. The belt pulley acts as a permanent fly-wheel of considerable angular momentum, and provision is made for the use of an auxiliary fly wheel, made in halves and clamped to the pinion shaft, to obtain comparative results.

The sleeve on which one of the test gears is mounted is carried on 1 in. balls in bearings dowelled to the swing frame, and the other test gear is carried on the end of the central shaft, between an outer bearing on 15/16 in. balls and insulated bearings in the sleeve. All bearings are insulated to provide for electrical connections, as will presently be explained.

When the pinion shaft bearings are loosened on the swing frame, the latter can be traversed with the fixed bearings to any desired center distance by the lead screws, and distance pieces set between the bearings will insure perfect shaft alignments. To guard against irregularities in pitch or adjustment of the lead screws, a slip joint is introduced in the bevel gear shaft, and by this means the screws can be turned together or independently, as desired.

Now it is evident that if the engaging teeth are perfectly formed and spaced, the gear wheels will run side by side in unison, and that if imperfections exist they will cause the test gears to shift relatively to each other, thus gaining and losing in speed and causing increments and decrements in the load carried on the teeth.

So it occurred to the writer after seeing the results obtained by Logue, that this shifting of gears could be made visible by suitable multiplying levers attached to them as shown in Fig. 3, to actuate a scriber moved radially as they turned against a stationary receiving plate. To accomplish this result the scriber is mounted in a link between radius arms so centered as to form a Watt parallel motion, and it is made to act under light spring pressure against a plate of smoked glass or photofilm by levers which multiply the differential movement about 300 times.

Watt's Parallel Motion Effective

Although Watt's parallel motion is not quite perfect, it will be seen that between the limits to which it is here applied it is very simple, effective and accurate. Originally these levers were all mounted on pin bearings, half of which were subsequently changed to plate fulcrums at the suggestion of Major Buckingham, to whom we are also indebted for a very ingenious optical device for taking diagrams at speed.

The diagrams made as shown in Fig. 3 require a very slow and steady rotation of the pinion shaft to avoid undesirable momentum in the multiplying levers, and this is produced when desired by a small motor carried

on the gear cover at the end of the pinion shaft. This motor is belted to a light shaft beneath, which engages a train of reduction gears to the heavy pinion shaft. This train of gearing and all parts used in tracing a diagram are, of course, disconnected when the test gears are run at speed.

If there were no irregularities in the gears the scriber would trace a perfect circle, but since absolute perfection is unattainable, the scriber will move in and out as it turns with the test gears, and trace a line indicative of acceleration or retardation which, when interpreted with reference to the conditions imposed, will give the increment or decrement in the load carried on the teeth, and this may or may not be found proportional to the speed squared. The radial movement of the scriber will show the plus and minus displacements, the mean of which will form the basis for comparisons, and it will be seen that the nearer the curve approaches to a radial line the greater the intensity of change at that point. Every tooth on both test gears will appear for identification on the diagram and a pronounced irregularity can be located at once on the gears.

Here there is no attempt to produce an ideal transmission by means of friction discs or tapes against which irregularities can be measured, nor is there any objection to the use of such means or any other means of checking up results. But in these diagrams each gear forms the basis of comparison for the irregularities of the other and each is at or near its pitch point when the other is entering or breaking contact.

Nothing in Mechanism to Slip

There are presumably two positions of the engaging gears in which their lines of action intersect the line of centers at the pitch point, and at least two other positions where their lines of action intersect each other on the line of centers above or below the pitch point, and in these four positions, or more, perhaps, for every pitch traversed, the test gears are in unison and the stylus is describing a circular arc or a curve of inflection tangential thereto.

There is nothing in the mechanism employed to slip or stretch, it takes no part of the load carried, and it is possible by reason of this positive connection to produce diagrams under light or heavy loads, a comparison of which may reveal the effects of compression and elastic deformations, tending to modify the law of the speed squared which applies only to rigid solids. But however this may be, the results hitherto obtained come from the consideration and manipulation of very minute quantities, the mutliplication of which may also multiply unsuspected errors.

After working on this mechanism in the hope of finding some way to measure the increment load direct until this seemed hopeless, the writer began to think of the decrements entailed by increments, as pointed out by Logue, and came to the conclusion that when the initial load disappeared and caused the engaging teeth to break contact there would be a distinct change in the noise, after which he hit upon the better plan of insulating the gears and using an electric circuit to announce through telephone receivers a break in contact with the pinion by either or both test gears.

Referring to Fig. 2, one or more dry cells are connected by a wire, as shown, to the pinion shaft through which the current passes to the gear wheels in contact and divides into two branches, returning through telephone receivers in each branch to the opposite pole of the battery. This scheme was submitted to an electrical expert, whose advice was to rest assured that the breaking of contact between the teeth would be announced in no uncertain way and that variations in pressure might also be expected to make a noticeable change in the sound of the running gears, and more recently Professor Greene of the A. S. M. E. Committee has confirmed this assurance.

Having set up an initial load on the test gears by means of the torsion device at the end of the telescoped shafts, the exact amount of pressure on the teeth can be weighed on the scales under the swing frame by engaging the pawl on the cross bar with one of the gear wheels and pulling on the belt or flywheel until a sharp click in the telephone receiver announces a break in contact.

Operation of the Machine

The gain or loss of weight on the scales should then be noted and converted into the pressure on the teeth by a simple proportion expressing the ratio between the radius of the swing frame at the cross bar to the radius of the pinion. The locking pawl may now be disengaged and power applied to drive the pinion shaft at a gradually increasing speed, which will be indicated by the tachometer located for convenience above the little motor on the gear box. At the same time the telephone receivers are ready to announce a break in the circuit, and when this occurs the speed is noted.

Having passed the speed required to break contact, the power may be reduced and another observation taken when continuous contact is resumed. These observations, when repeated for various initial loads, will establish the relation between speed and decrement loads and take cognizance of all the variables which enter into the problem. When the law of the speed squared is not sustained by experiments, it becomes evident that elasticity or a shock-absorbing medium is making itself felt in the action of the running gears, and it is hoped that a way may be found to establish an electric circuit through contact with wood fiber or rawhide pinions as well as through cast iron or steel and so subject non-metallic substances to the same speed tests.

But while increments and decrements are necessary counterparts in the maintenance of the initial or average load, they are not necessarily of equal intensity because their durations may be different, and consequently the diagrams will help to establish the relation between increments and decrements in any given case.

Having determined in this way the increment load for any given speed, the result applies to the test gear when

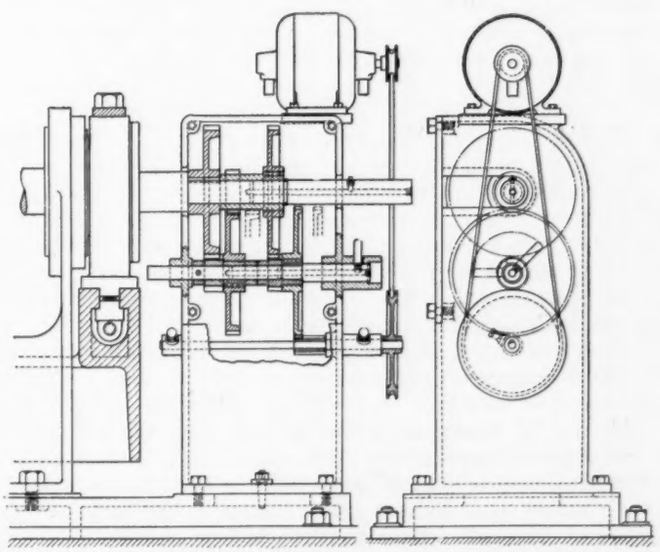


Fig. 4—Motor driven gear box for recording mechanism

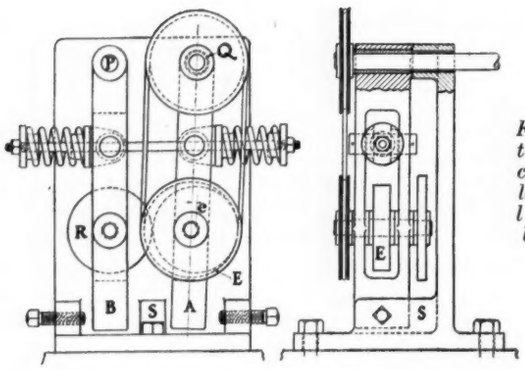


Fig. 6—Gear testing machine oscillating pendulum driven by eccentric

running with a pinion of much greater mass or flywheel effect, and it remains to be seen what this increment might become if the pinion were attached to a flywheel of infinite mass. For the pinion shown in Fig. 2, its angular momentum compared with that of the test gears is relatively much greater than that of the larger pinion shown in Fig. 5, although the larger pinion naturally increases the angular momentum of the shaft and attachments to which it belongs.

But in view of the fact that the test gears are substantially equal in mass and flywheel effect, and, running as they do, with a pinion whose pulley is a massive flywheel, under conditions that impose substantially equal, opposite and approximately simultaneous reactions upon the pinion, there is no reason to ascribe much if any variation to the movement of the pinion, which runs in consequence as though attached to a flywheel of infinite mass. This may not be strictly true, but it is not far wrong for a small pinion, and to determine whether or not the pinion shaft suffers any appreciable fluctuations in speed, the auxiliary flywheel made in halves has been provided to make comparative tests.

If the reactions of the test gears are equal, opposite and simultaneous, the addition of another flywheel will have no effect. But if the extra flywheel has an appreciable effect upon the decrement load, it is possible to determine the maximum result attainable with a flywheel of infinite mass from the relative moments of momentum as found for the pinion shaft with and without the extra flywheel.

In this connection, it is necessary to ascertain the angular momentum of each test gear and its connections, in terms of the angular momentum of the pinion shaft complete with and without its auxiliary flywheel, and referring again to Fig. 2, attention is directed to the apparatus indicated somewhat diagrammatically as a torsion pendulum with solenoid escapement.

Adjusted to Any Desired Amplitude

A slender rod of tempered steel about ⅜ in. in diameter and 5 or 6 ft. long is attached to the end of the pinion shaft at one end and to an anchorage at the other, having a slight rotary movement between adjustable stops. Pole pieces are carried by a light cord from a groove in the torsion rod near the pinion shaft, to reverse the effect of the solenoids upon a core attached to the swinging arm at the anchorage.

The movement of this arm at the beginning of each reversal augments the torsion in the rod, and it can be adjusted to maintain any desired amplitude in the oscillations. By disengaging the pinion from the test gears its periods of oscillation with and without the auxiliary flywheel can be taken, and then, after taking periods with either or both test gears engaged, the data for the desired moments of momentum become known.

In the gear-tester there are three units cooperating to produce effects by reason of their inertia, the pinion shaft with one or two flywheels and the test gears, which partially or wholly neutralize each other in their reactions, whereas ordinarily reactions would be confined in practice to a pair of gears or a gear and pinion.

To illustrate the reactions of rigid forms in rolling contact, attention is called to Fig. 6, showing a stand S on which two pendulums A and B are mounted with rollers E and R held together by a load spring. B hangs on the quill Q, through which a shaft is carried to a pulley belted to a shaft on the eccentric roller E, and a balance wheel at the other end completes the pendulum A, which is heavier than B by reason of its additional parts. Either A or B can be attached to the stand S, making it substantially earth-fast and immovable, and locking A to S, the eccentric E can be run at a certain speed and the spring tension adjusted to break contact under an initial load, b. Similarly when B is locked to S and the eccentric E driven at the same speed the roller E will break contact under an initial load, a.

These loads, a and b, are called increment loads, because determined for A and B with reference to infinite opposing mass. Moreover, a and b are respectively proportional to the angular movements of A and B which may be represented by A′ and B′. But when A and B are free from S, the initial load, I, required to maintain contact becomes

$$I = \frac{ab}{a + b}.$$

A diagram of these reactions can be applied to a pair of gears under constant load as shown in Fig. 7. At slow speed the pressure on the teeth is constant, but as the speed increases it rises and falls, as shown by the wave line, maintaining a constant mean, and at any constant speed the shaded areas above and below the mean line

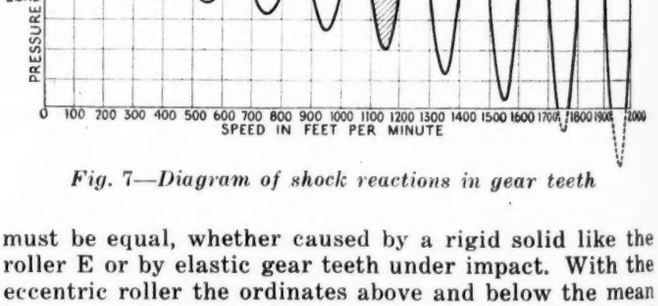


Fig. 7—Diagram of shock reactions in gear teeth

must be equal, whether caused by a rigid solid like the roller E or by elastic gear teeth under impact. With the eccentric roller the ordinates above and below the mean line, as well as the shaded areas, must be equal, and with gear teeth this may also be true, although not necessarily so. The increment may exceed the decrement, and evidence as to whether it does or not must be looked for in the gear diagram.

Without venturing to impose upon you a mathematical analysis, which had better be seen than heard, let me say that the auxiliary flywheel seems to solve the problem as to absolute decrement loads and that the diagrams point the way for their conversion into increment loads. The diagrams will show the errors and the speed tests will show the corresponding effect upon strength, so that ultimately the errors will be correlated to the strength at speed without breaking anything and with a clear understanding of cause and effect. The same apparatus can be used also in tests of efficiency and endurance.

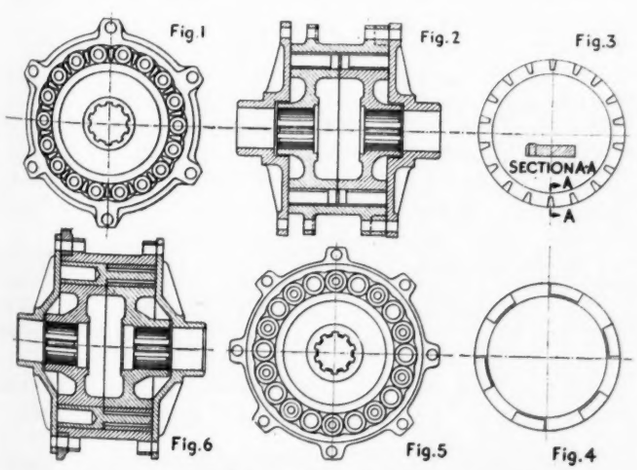
New Differential Prevents Stalling When One Wheel Turns Free

Is a gearless, self-locking type, and involves no change in method of operation. Vehicle equipped with it can be run even though one live axle is broken. Permits complete freedom of relative motion between two rear wheels. Tire wear decreased.

WHAT is in some respects one of the most interesting designs of differential, produced for some years, has recently been developed by C. Andrade, Jr. The new design is a gearless, self-locking type and is so arranged that it delivers most, or if necessary, all of the power transmitted to the wheel that has the most resistance on the road bed and therefore prevents the vehicles in which it is installed from stalling when one wheel only has traction and the other wheel is on slippery footing. In this respect it will be noted that the differential functions in a manner exactly the reverse of that of the conventional gear type differential.

On the other hand, the differential performs all of the desirable functions of the ordinary differential in permitting one wheel to run ahead of the other as the vehicle rounds a curve. In fact, so far as the driver is concerned, the operation of the vehicle is precisely the same as with a vehicle having the ordinary differential except under conditions of slippery or uncertain footing, in which case the new type overcomes the disadvantages of the conventional type.

An assembly of the new differential in one form is shown in Figs. 1 and 2. The outer, or driving member, is made in three parts, two of which are identical flanged hubs and the third a drum, the inner surface of which is broached to form a number of cylindrical surfaces, the axes of which lie in a cylindrical surface whose axis is the axis of rotation of the differential. The two inner driven members are splined to the axle ends and have external surfaces which are true cylinders of equal diameter. Between the driving and the driven members lie two sets of rollers, of such diameter that they clear the arcs or cylindrical surfaces of the driven member when the latter is in neutral position, as shown in Fig. 1. When the driving member starts to move ahead, the rollers all lock after they have moved about 1/16 in. behind the center of the eccentric arcs, due to the wedging action which results.



Andrade differential. Figs. 1 to 4 show assembly and parts for one type, and Figs. 5 and 6 assembly of a second type

When one of the rear wheels start to run ahead of the master gear, as the outer wheel does when the car rounds a curve, the rollers engaging that driven member roll out of locking contact and go back to the centers of the eccentric arcs. They cannot go beyond this point for the reason that the control members shown in Figs. 3 and 4 prevent them from so doing. The control members are provided, on their back faces, with lugs similar to the jaws of a positive clutch, which permit them to turn only 1/16 in. in relation to each other.

Engine May Be Used as Brake

In backing the action of the differential is precisely the same as in forward motion and it also permits the normal operation of the car when the latter is going down hill and the engine is used as a brake driven from the rear wheel.

Because of the large number of rollers, their considerable length and their distance from the axle center, there is said to be only a small fraction of compressive stress on each inch of length of the rollers as there is on the gear teeth of the ordinary gear type differential.

Figs. 5 and 6 show an alternative construction of the new differential in which the control members are eliminated. In this case the rollers on one side are provided with integral pins of a diameter smaller than the roller itself. These pins are so arranged as to project through the hollow rollers on the other side, and still give 1/16 in. relative circumferential displacement. In this type the construction is simplified, more rollers are used, and the rollers are of greater length, for a given distance between the flanged driven members.

When the power is applied to the differential, the rollers lock and power is transmitted through motionless locking surfaces so that the wear is said to be practically negligible, even though the rollers and locking surfaces are not hardened.

It will be noticed from the assembly drawing that the rollers form the only driving contact between driving and driven members. When the rollers are driving they are wedged between the driving and driven members, but the wedging action ceases immediately when the transmission of power through these parts ceases, and the rollers return to their neutral position. It is claimed

that the new type of differential overcomes the disadvantages of some other type which, when once locked, can be unlocked only by applying an equal torque in a reverse direction.

Among the other advantages claimed for this type of differential may be mentioned the following:

It permits complete freedom of relative motion between the two rear wheels, that is, if one wheel is rotating at a given speed, the other wheel can rotate at any faster speed, whereas if the gear differential in one wheel is rotating, there is a fixed ratio between its rotation and the rotation of the master gear with the other wheel.

It permits the car to come home on one sound axle even though the other live axle be broken.

It obviates the fault of the gear type differential which is manifest in the case of a car traveling at fairly high speed when one of the two rear wheels is thrown off the ground by striking an obstruction. The engine immediately speeds up this wheel and for a moment there is no driving on the other wheel with the ordinary type differential, while the car is carried forward, only by its own inertia. When the free wheel again strikes the ground, considerable chafing of the tire takes place with consequent increase in wear. The new differential does not permit the engine to cause one wheel to race ahead of the other at any time, and it always keeps the power on the driving wheel.

In a test of the new differential recently witnessed by the writer, one rear wheel of the car to which an axle with the new differential was fitted was raised on a jack which was itself mounted on wheels. The engine was then started and the clutch thrown in, whereupon the car moved either forward or backward, as desired, with only one wheel touching the ground. The wheel which was in the air rotated at the same speed as the driving wheel, but it was possible to take hold of this wheel and spin it faster than the wheel on the ground was turning in the same direction of rotation. With the same arrangement in the case of a car with the ordinary type gear differential, it would, of course, have been impossible to move the car since all the power of the engine would have been delivered to the free wheel in the air, while the other remained stationary.

The new differential is the subject of a number of patent applications upon which shop licenses are to be granted.

Survey of Aircraft Activities Shows France Far in Lead

SOVIET Russia has begun the development of a great commercial and military aircraft program, and occupies an important position in the international race for supremacy in the air, according to the Aeronautical Chamber of Commerce, which has made public its annual survey of aviation throughout the world.

The report, covering flying activities in fifty-eight countries, finds France the leader of all nations in both commercial and military aviation, and still working on heavy programs. The survey of the Russian activity, however, is of unusual interest.

Russia is using German, French and Dutch airplanes. Special aviation schools have been established at Toula, Moscow, Smolensk, Kharkow, Pola, Ekaterineslaw, Mokilaw and Petrograd. The Council of Commissaries has voted to obtain 300 new airplanes for the Red Army. It is reported authoritatively that 100 planes have been bought from Italy. In four cities the government has established domestic aircraft factories. The program for the year is to equip fully seventy fighting squadrons.

In all, the Soviet government's program calls for 5000 airplanes with spare parts. With the assistance of German aeronautical experts plans have been made for exploiting vast territories. Great trunk lines have been charted. It is proposed to have in operation by 1926 many thousands of aircraft. German pilots are expected to join the comparatively few Russian aviators on the commercial lines.

France Developing Air Defense

France, in developing the colonial air defenses, operates a passenger and mail service three times weekly between Algiers and Biskra, another between Oran, in Western Algeria, and Casablanca, on the west coast of Morocco, twice weekly. During the first eleven months in 1922 the French built 3300 airplanes for military and commercial purposes, and let orders for 1200 additional machines. The French program for 1923 calls for 200 air squadrons, with ten machines to a squadron, or 2200 planes with 100 per cent reserves. French air appropriations were greater in 1922 than all nations combined, aggregating $84,591,755.

Tests of Aluminum Alloy No. 3

AN investigation of a variation of aluminum alloy No. 3 in which the iron was replaced by small amounts of magnesium has been made by the Materials Section of the Engineering Division of the Air Service.

Alloy No. 3 contains 2 per cent of copper, 10 per cent of sinc and 1 per cent of iron, and in the experiments the latter was replaced by 0.5 per cent of magnesium. The following conclusions are drawn from the investigation:

Use of magnesium in place of iron in aluminum alloy No. 3 is not advisable. An equal tensile strength in the "as cast" condition may be obtained with the addition of from 0.25 to 1 per cent magnesium in place of the iron, but the ductility, as measured by the percentage of elongation, is from 50 to 65 per cent lower. The hardness values are appreciably higher.

The best results were obtained with 0.5 per cent added magnesium, while with over 1 per cent, both the tensile strength and elongation fall off very rapidly.

Tensile strength and hardness of the alloys in the magnesium-zinc series may be increased at the expense of the elongation by suitable heat treatment, but due to their low ductility and higher specific gravity they are inferior to the alloys of the duralumin type.

The following physical properties were obtained from aluminum alloy No. 3 with 0.5 per cent magnesium in place of iron:

Tensile strength, pounds per square inch	35,680.00
Elongation in 2 inches, per cent	0.83
Brinell	80.00

Better Cattle Market Makes Big Sales Probable in Argentina

Spring and summer selling season best experienced by importers of American products since 1919-1920. Live stock industry has passed through severe crisis. Agriculture is growing. Road developments going forward rapidly. Wide interest in racing.

THE spring and summer automobile selling season in Argentina, now fast growing to a close, has been by far the best experienced by importers of American automotive products since that of 1919-20, despite the fact that Argentina's cattlemen have been going through one of the severest crises they have ever faced. Business has been evenly distributed among all dealers in popular priced American cars.

In January, Ford's Argentine branch broke all its previous sales records, disposing of 2600 passenger cars and trucks. The Ford organization of 300 agents, scattered throughout the country, is making a splendid effort to put the Lincoln on the map. Production at the Ford assembly plant is now about ninety cars per day.

Ford agents in Buenos Aires are attracting considerable attention by erecting in front of their places of business barometers on which total Ford sales are marked up from day to day. Given the popularity of the Ford car throughout the country, it is now the habit of many business men to watch these daily sales as a sort of indication as to how things are going with the rural communities, for increasing or diminishing prosperity among the farmers and cattle men is quickly reflected in Ford sales.

Throughout the season the bulk of Ford sales have gone to agricultural sections; business in districts given over almost exclusively to cattle raising has been exceedingly dull. This statement applies, of course, to the sales of other automobile importers as well as to Ford. Farmers in every part of the country have harvested a satisfactory crop. While prices for wheat are a shade under what was expected, growers are still receiving a fair margin of profit. The export movement of linseed and wheat, though somewhat slow, is steady, and present prospects for disposing of the entire crop at reasonable prices are good.

Crop Conditions Improve

Though the coming winter has been dreaded by Argentine dealers, owing to utter lack of a system of highways capable of withstanding heavy rains, two outstanding features indicate that it should be more satisfactory than any other since 1919. These reasons are:

1. Owing to opportune rains there will be an abundance of natural pasturage for the pastoral sections during the autumn and winter, and the ground in agricultural regions is in fine shape for plowing for the new wheat and linseed crops.

2. Decided improvement in the tone of the cattle market has been noted during the latter weeks of March.

While cattle prices have not advanced notably, it is believed that the present upward tendency will continue. The psychological effect of the better tone of the cattle market on hundreds of thousands of ranchers will induce them to spend money more readily than heretofore. Moreover, all of Argentina's production machinery is intact and is functioning regularly. Some lines of business have become normal and are expanding, while those that have not made such progress are on the road to better times. If improvement in the cattle trade continues, automobile importers may count on an increasing demand for many years to come. That the cattle trade should continue to improve is more than probable because of increased overseas demand for beef and smaller beef production in Argentina.

Cattle Killed for Hides

Argentina's decreased production of cattle has been brought about by the killing of thousands of heads for their hides. Hides being worth more than the live animal, deaths by foot and mouth disease and other natural causes were not combatted owing to low values and a failure to breed animals. Low prices of cattle were responsible also for turning hundreds of thousands of acres formerly dedicated to pastures into agricultural areas. Likewise, Argentina's supply of sheep has diminished from 30 to 40 per cent. The result is that beef from now on will not have to meet such severe competition from mutton.

To anyone who reads the signs of the times it is apparent that the economic life of Argentina's rural communities is rapidly changing. The bulk of American automotive sales are in these districts. Rising land values and rentals, higher cost of living and higher wages, are causing the disappearance of the old style criollo ranch dedicated exclusively to livestock breeding on a vast scale. Mixed farming and ranching is gradually taking its place. The increase in wealth that this evolution is bound to bring about will mean much to the settlement of the country, the improving of country roads and, as a consequence, the raising of the standard of living. All these factors contribute to Argentina's expansion as a market for automobiles, trucks and tractors.

The present time is propitious for redoubled efforts by American automobile manufacturers to work out plans for the future growth of their River Plate business. The coming spring and summer selling season—from September, 1923, to April, 1924—probably will witness the biggest sale of American cars ever put over in the Argentine.

Argentina's interest in goods roads continues apace. There has never been a time when road construction, maintenance, legislation and financing were more discussed in public print.

Particular interest is expressed on all sides regarding the final outcome of the proposition made by George B.

Nolan, Inc., to the government of the Province of Buenos Aires for the construction of 10,000 kilometers of four distinct types of roads in the Province. The proposers offer to provide $20,000,000 U. S. currency to cover the cost of construction and maintenance of these roads for a period of twenty-five years. The work is to be undertaken by administration, and while 60 per cent of the engineers to be employed must be taken on locally, the remaining 40 per cent may be contracted for abroad. If the proposal is accepted by the Provincial authorities, construction work will begin immediately. Supervision will be in charge of practical American road men.

Enthusiasm for Racing Grows

Enthusiasm for racing is growing from month to month and seems to be general throughout the country. Several important races have taken place in recent weeks, and a number are planned for the month of April. Unfortunately roads suitable for holding real automobile races are not available, however, so the races as at present conducted can hardly be considered as an opportunity for judging a car's speed. They do demonstrate most efficiently the stamina of American cars in standing up under the most trying conditions, and likewise prove the skill of the conductor in getting over almost insurmountable obstacles.

Probably most importers of American cars will be represented at the International Samples' Exposition to be held under the auspices of the government of the Province of Buenos Aires at La Plata from May 25 to June 15. This is the first attempt of a provincial government to hold such a fair in Argentina, and a strenuous effort is being made by Governor Cantilo to make this exposition a real success. It will be held annually if successful. Importers probably will take advantage of the Dairy Cattle Show, to be held in the Rural Society from May 5 to May 17 as well.

The great expansion in agriculture which is now taking place has led importers of American tractors to redouble their sales efforts. J. I. Case Threshing Machine Co. has just held a tractor convention, and has given instructions to the managers of branch houses and salesmen to get tractors in the fields at all costs. It is realized, of course, that before tractors play a leading role in Argentine agriculture much educational work will have to be done and many sacrifices made by importers. Conditions on Argentine farms are changing, however, and the tractor must inevitably come into its own.

A recent development in the River Plata automobile world is the opening of a direct branch in Montevideo by the Studebaker Corp. of America under the managership of Percy C. Tynan, formerly assistant manager of the Buenos Aires branch.

The reports on the astounding progress of the American automotive industry are followed with the keenest of interest by Argentine people, who feel that the product of American automobile factories is one of the strongest links in the chain of trade between the two countries.

Winter Months Best Car Sales Period in India

NOVEMBER, December and January are the best months in which to sell automobiles in India, according to Trade Commissioner C. C. Batchelder of the Department of Commerce, who has just returned to Washington from that country. These months are cool, dry, pleasant and generally conducive to motoring. The crops have been harvested and the limited class of people who buy automobiles are accustomed to visit the cities at this time. This is especially true of the Christmas season, when visitors to Calcutta and other centers are numerous, many of the visitors staying a month.

Sales fall off rapidly toward the end of February, when the weather begins to turn warm, and decline progressively through March, April and May, as the heat increases in intensity and inhabitants who are able to do so flee from the hot, dry, dusty cities to the hills or to foreign countries. In February and March, however, there is some trade in used cars, as people going abroad like to sell their cars. It has been found cheaper to sell a car on leaving India and to buy another on returning than to pay for the depreciation on a stored car, which is heavy.

Rains begin in June and sellers of high-priced cars report that they can do little or nothing then, though there is some revival in inexpensive closed cars, which protect their occupants from the wet. July and August are hot, the ground is soaked, riding is not a pleasure and practically all the car buying population is now well away from the selling centers.

People begin returning from the hills in September and the automobile business picks up a little, particularly in cheaper cars. In October those who have been abroad begin to come back and inquiries for cars increase. In November inquiries commence to crystallize into orders and the cycle is completed.

The market for used cars in India is not good at present, Batchelder reports, as the cheaper American cars now seem to have been found more satisfactory than any other car used, even at low prices.

The practice of selling cars on going abroad (most Europeans in India go home every two or three years) and buying a new one on returning is greatly in favor of the inexpensive car, as the loss in buying and replacing is much less than on a high-priced machine. Another factor favoring the cheap car is the 30 per cent import duty. Many buyers have only a definite sum which they can spend for cars and they have to make it go as far as possible. People have learned the value of the low-priced and medium-priced American car, and it will be difficult to persuade them to invest in those of higher price.

European cars are being sold in India almost exclusively on a basis of lower gasoline consumption. Gasoline in Calcutta, when Batchelder left there, was selling at Rs. 1-14-0 an imperial gallon (a rupee is usually 32 cents) and it was reported that in the interior the price was equivalent to 87½ cents.

Theoretically it should take from a month to six weeks for an automobile to reach India, but actually it often takes considerably longer, depending on the way ships happen to be sailing, the amount of cargo offered, the ports of call, etc. Shipments should be arranged to reach India in November, January and December. If they arrive in February or in the summer they will not only be difficult to sell, but some of the less responsible dealers may refuse to meet their drafts.

Questions Better Adhesion of Large Section Tires

Theory is said not to agree with claims made for higher traction and freedom from skidding. On soft, wet roads coefficient of friction may decrease with increase in area of contact.

Editor, AUTOMOTIVE INDUSTRIES:

I READ with interest the article on "Far Reaching Effects Are Predicted for Large Section Tires" appearing in your issue of April 12, and as some of the advantages claimed seem to me contrary to theory and to past practice, many of your readers would, no doubt, like to hear the technical reasons for these results.

I am especially referring to the claims of better adhesion, decrease in slipping, freedom from skidding, increased traction and braking action.

While frankly admitting that I have not tested these tires, I will discuss the quality of skidding from a theoretical standpoint and then describe my experience to prove this theory.

If the road surface is dry, smooth and very hard or "unyielding," the coefficient of friction should be the same regardless of tire area on the road or the pressure per square inch. For example, if the coefficient of friction between tire and road surface is 0.6 and the load on the wheel 1000 lb., the frictional resistance to skidding forward or sidewise would be 600 lb., irrespective of tire area on the road.

On the other hand, if the road is muddy or wet or the surface not very hard, the coefficient of friction will decrease with an increase in tire area—the total load on the tire remaining the same. For instance, if the 1000 lb. load referred to were resting on 10 sq. in., the pressure per square inch would be 100 lb., while if the area were 4 sq. in., the pressure would be 250 lb. per square inch.

It is evident that the greater this pressure, the more thoroughly would it squeeze all the mud and moisture from the contact area between tire surface and road surface; when the pressure is smaller, a thicker film of mud will remain on the road surface and this will considerably reduce the coefficient of friction, and hence, theoretically, the tendency to slipping or skidding would be greater.

The writer's knowledge of the experience of the old London Electric Cab Company may be of interest. This company had some seventy electric taxicabs running in London in 1899. Solid tires were used, having a width of approximately 1¾ in. (I do not recollect the exact dimension). As these tires wore out rapidly, it was decided to use a wider tire. As far as I remember the width was increased to 2½ in. and a half dozen cabs were equipped with the wider tires. After the drivers had these cabs out the first wet day (and in the fall and winter in London wet days are the rule) they refused to take these cabs out again, asserting that "they skidded from one side of the street to the other."

It would seem, furthermore, that the narrower the tread, the less liable it is to skid over the small inequalities which are present on even the smoothest roads, while a wider tread will rest on the top of a larger number of these inequalities.

A larger pneumatic tire will also allow a greater amount of side-sway of the chassis (due to the rolling of the tire from side to side) before any actual sliding motion takes place between tire and road surface, and therefore when a tendency to skidding exists, the entire load will swing sidewise a certain amount without resistance, thus gathering momentum; in such event the tendency to skidding is increased, and as soon as skidding takes place the coefficient of friction is lowered.

The coefficient of friction of motion is lower than that of rest; this accounts for the fact that once a car starts to skid, it will usually move for some distance before coming to rest.

The article referred to states that, "The larger and softer tire has, of course, a considerably greater area of contact with the ground. For this reason the unit pressure for a given weight is considerably lower——" etc.

It seems to me, therefore, a trifle exaggerated to say that "the 7 in. tire handles better under slippery conditions without chains than 5 in. tires fitted with chains."

Perhaps you, or the manufacturers and engineers who made these assertions, will supply the technical reasons for such remarkable qualities which seem contrary to theory.

ETHELBERT FAVARY.

Non-Skid Feature Startling

Editor, AUTOMOTIVE INDUSTRIES:

I have read with interest Ethelbert Favary's theoretical deductions with respect to slipping, skidding, traction, and brake effect of the large section, thin cord tires which are causing such a furore in the automotive industry.

Favary's theories are entirely correct when applied to a theoretical tire which would be infinitely thin and perfectly smooth. But, tires have to be practical, and among the most practical of tire requirements are reasonable resistance to skidding and slipping, sufficient traction effect and satisfactory braking effect.

In order to fulfill these practical requirements tires are designed with so-called non-skid treads. This tread con-

figuration presents edges of rubber to the road in all directions from the center of the area of road contact, and the efficiency of the tread design depends upon the proper balance between the number of edges presented in the several directions, the total area of actual road contact of the tread, and the plasticity of the tread compound.

These large, thin tires are designed with a non-skid tread which takes full advantage of the larger cross section and the increased flexibility of the carcass and their non-skid and braking effects are really startling.

S. P. THATCHER,
Technical Assistant to President,
United States Tire Co.

Urges Standardized Sleigh Treads

Editor, AUTOMOTIVE INDUSTRIES:

Here in northern New York State we are working to bring about a standard sleigh tread of 56 in. from center to center. We all know that eventually the main highways or State roads will be kept open by ploughs, but it will never be possible to keep all cross-roads and side roads ploughed. The adoption of 56 in. sleigh treads would make possible the keeping open of these side roads.

My knowledge of the condition of the roads is firsthand, as I have been trying to drive in the country recently. Fair going can be made when a track has been made, and in long stretches where snow has been blown off the road and is not deep. These stretches allow for easy passing of other vehicles, but in other places the snow has drifted on to the roads badly and is very deep, from three to six feet. Places like this would have to be dug out. Now we go around through the fields. In other places one to two feet makes difficult driving, but sleighs get through. I have driven slowly over such roads with one wheel on solid track and the other down to the hub in soft snow, and it could be so easily corrected.

Here are some of the benefits to be derived from standard 56 in. tread sleighs and sleds, with the consequent good roads throughout the winter for both sleighs and automobiles:

1. Medical attention would be procurable in rural communities on account of doctors being able to use automobiles and thus cover the same distance in the same time in winter, as they would in summer. There is a scarcity of doctors in the country, and in case of an epidemic, serious results will come from conditions such as now exist.
2. Less expensive and more prompt service by R. F. D.
3. Telephone service improved on account of quicker location of line trouble and use of repair trucks by telephone companies.
4. Farmers could continue to haul milk and other produce on their trucks or cars with saving of time.
5. Better social communication in country during winter.
6. Easier for farmers to go to church or town on account of shorter time required by car than sleigh, and as a rule, churches are a long distance from most farms.
7. Trucking business from town to town, and farms to town, necessarily improved.
8. Bus lines continue to run.
9. Commercial men enabled to cover their territory more often and at much less expense if able to use motor cars.
10. Because of the decrease in the use of the horse-drawn vehicle in summer there is a scarcity of horses for winter livery work, etc.
11. Less danger of sleigh loads tipping over.
12. Easier for horses in teams, as they now tend to crowd in the narrow tracks.
13. Less expenditure of taxes required in keeping State roads open, as only drifts would require attention.
14. With present sleigh treads and with main roads opened, as are sure to be soon, the farmer on the closed road will be decidedly up against it when winter breaks up. He will drive his sleigh to the main highway and will then find dry going. By use of 56 in. tread sleigh he can give up his sleigh for his car as soon as main roads begin to get dry.
15. With standard treads, the ice could be broken down in the spring when sleighing was over, by putting a standard wagon on the road and in this way hurry the thawing of the ice. Also, every bit of traffic and the greater abundance of traffic would bring good dry roads earlier in the spring, both cross roads as well as highways.

FRANK C. CHAPMAN.

Steering Raises Axle When Pivots Are Inclined

Editor, AUTOMOTIVE INDUSTRIES:—

Herbert Chase's paper on steering has elicited considerable discussion of all kinds of steering systems, particularly that with transversely raked pivots. Among some of the points discussed, is the question as to how much the front axle, with a transversely raked pin rises or falls relative to the ground, when the wheels are turned.

In my paper of December 14, this point was not thoroughly threshed out, because it was then realized by the writer that its analysis would lead to considerable complication. In the meantime, however, the writer has been criticised by his friends, and for this reason, an abbreviated solution of the problem is offered. A slight short-cut used in the analysis leads to an error not to exceed 1 or 2 per cent.

In Fig. 1, we have illustrated a steering knuckle with the pivot pin raked transversely so that its axis intersects the central point of contact between tire and ground. Every part of the wheel rotates about axis *BB* when steering. In other words, if the pivot axle could be freely rotated around the center line *BB*, the line *KH* would generate a cone with *H* as apex and *KK* as its base. If the road is perpendicular to the line *BB*, no raising or lowering of the front axle can take place. However, ordinarily this axis *BB* will form an angle with the road other than 90 deg. To determine the position of the axle relative to the road, as steering progresses under the latter circumstances, it is necessary to resort to the following analysis:

In Figs. 1 and 2, let axes *OX*, *OY* and *OZ* represent a system of rectangular coordinates. The plane determined by *OX*, *OZ*, we choose to contain axis *BB* and skeleton lines *AK* and *KH* as shown. In other words, the pivot axis *BB* and the lines *AK* and *KH* are in the same plane as axes *X* and *Z*. If we now, with the aid of Fig. 2, imagine the line *AK* representing the pivot axle to be turned through a certain angle, let us say to *K'* forming an angle *KAK'*, the projection of this angle into the plane *XY* is represented by *HOH'*. Assume the projected angle to be 30 deg., representing, of course, a good sharp turn. The projection of *K'* is, of course, *H'* having coordinates of $X = AK \cos 30$ and $Y = AK \sin 30$. Here we have assumed that *AK* after projecting in the *XY* plane is represented there in full length which, for all practical purposes, is near enough, and it simplifies matters consider-

ably. Having determined the coordinates for H', and realizing that HK' must be equal to HK, given in Fig. 2 as 16 in., we can determine the distance between K' and the point of contact between tire and road. The difference between this distance and 16 in. is the amount the axle has been raised. It is,

$$HH' = \sqrt{(2\tfrac{1}{2} - X)^2 + Y^2} = \sqrt{6\tfrac{1}{4} - 5X + X^2 + Y^2}$$

Considering that $X^2 + Y^2 = 2\tfrac{1}{2}^2$ we find,

$$HH' = \sqrt{6\tfrac{1}{4} - 12\tfrac{1}{2}\cos 30 + 6\tfrac{1}{4}} = \sqrt{1.675} = 1.2945$$

From the geometry of Fig. 2, we see further that,

$$\overline{HK'}^2 = \overline{HH'}^2 + \overline{H'K'}^2$$

Inasmuch as,

$HK' = HK = 16$ in. and $HH' = 1.2945$, we obtain

$$H'K' = \sqrt{16^2 - 1.2945^2} = \sqrt{254.325} = 15.948$$

$H'K'$ is the vertical distance between K' and the road. However, we know that the wheel in its 30 deg. off straight position rests on the ground under an angle different than 90 deg. For this reason, the distance between K' and the central contact point between tire and road will be larger than 15.948. Considering that the wheel radius is 16 in., we find that for a steering angle of 30 deg. the front axle is raised a distance, 16 — 15.948 = .052 in. Inasmuch as we neglected in our calculations the fact that the wheel in its new position does not stand vertical on the road, the amount of raising is even less. The work required to raise the axle for a fairly heavy car is $2500 \times .052 = 130$ in. lb. With an 18-in. wheel, an efficiency of 75 per cent and 1¼ turn required, the pressure on the steering wheel required to raise the car would be,

$$P \times 18 \times \pi \times 1\tfrac{1}{4} \times .75 = 130 \text{ or } P = 2.45 \text{ lb.}$$

OTTO M. BURKHARDT,
Consulting Engineer,
Pierce-Arrow Motor Car Co.

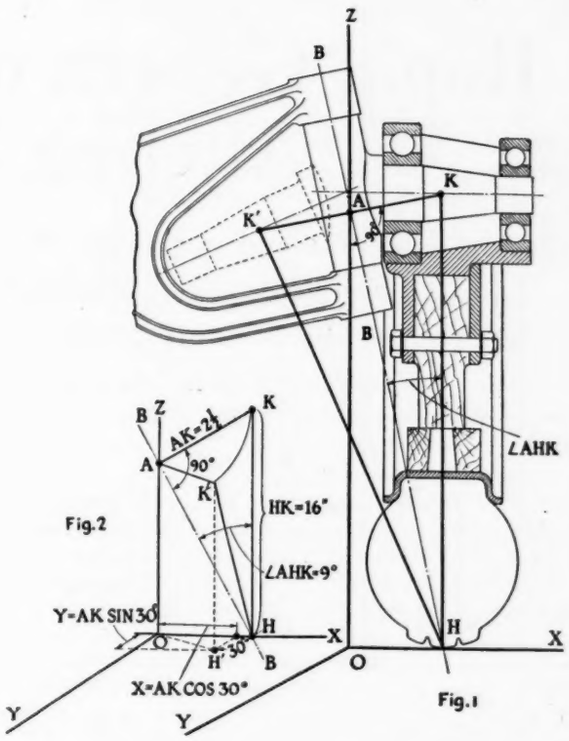


Fig. 2 Fig. 1

Honey as a Non-Freeze Agent

Editor, AUTOMOTIVE INDUSTRIES:

A mixture of equal parts of boiled honey and water make a more reliable non-freezing solution than water and glucose. The mixture will freeze at about the same temperature as a solution of 12 per cent denatured alcohol mixed with 88 per cent water.

W. W. MUIR.

Never Lost in Automobile Financing, Says Banker

THE automobile business was one of the few lines of business in which his organization did not lose money in 1920 and 1921, said Walter Lichtenstein, executive secretary, First National Bank of Chicago, in an address made recently before the Central Auto Finance Association.

"I am well aware," Lichtenstein said, "that there are many banks in this country which are reluctant to lend to automobile finance companies. I feel sure that this reluctance in many cases comes from not thoroughly understanding what the finance company proposition is.

"I know that the objection has been raised by some banks that the liabilities of finance companies are frequently out of proportion to their capital. Such a criticism is a valid one, where a large part of the liquid assets consists of merchandise, but it would be almost as reasonable to criticise a bank for its liabilities in proportion to its capital as it would a finance company for the simple reason that a bank, like a finance company, deals only in receivables and cash. I have even heard it suggested that a bank is at a disadvantage in comparison with a finance company, as most banks' liabilities are payable on demand, whereas every finance company knows just when its obligations become due.

"The reason for the heavy losses which the banks of the country sustained during 1920 and 1921 was that so many of their customers had large quantities of merchandise on hand, which in all cases shrank in value, and in some lines of business an enormous shrinkage took place. The finance companies had no such losses, the only merchandise they have being such occasional cars as they are compelled to take back because the notes which they secure are not paid.

"As a result, the experience of the First National Bank of Chicago, during 1920 and 1921, was that one of the comparatively few lines of business in which they did not lose any money was the automobile business. I think it is not too much to say that every finance company that we had on our books could, if we had requested them, have paid their notes as they matured."

Correction

IN the article entitled "Research Shows How to Increase Cylinder Fin Efficiency," by C. B. Dicksee, which appeared in AUTOMOTIVE INDUSTRIES of April 5, the abscissa scale for Fig. 12 was incorrectly marked. The scale as marked is from zero to 4500 ft.p.m. The point marked zero should be marked 500, and each of the nine spaces indicate an increase of 500, so that the scale, when properly marked, runs from 500 to 5000 ft.p.m.

Rapid Growth of Replacement Sales Altering Market Plans

Profit and advantage of new car business to retailer greatly overemphasized. Manufacturer must give further consideration to this growing factor to prevent dealer mortality. Demand for additional service facilities will continue to be heard.

By Harry Tipper

THE man who brings his car to a dealer to trade for a new car starts a series of transactions which end only when the vehicle has finished its useful life by adding to the metal junk pile. There are seventy of him out of every hundred buyers of new cars, as nearly as we can estimate the proportion. The old cars added to the dealers' used car department must be sold again to other car buyers. A proportion of these will trade a still older car, or sell it first in order to buy the second hand car conditioned by the dealer.

Just how many years the average car life spans is somewhat uncertain. It is usually placed at over five years and this time will do as well as any other estimate—although all of them must be looked upon with some suspicion at present. At any rate, with 12,000,000 motor vehicles in use, the number of transactions in any year is conservatively estimated at 5,000,000.

At a time when the production of motor vehicles was running at 2,500,000, an equal number of additional transactions were made to turnover the used cars in the hands of dealers and individuals. As registration increases this number will grow, so that it will become larger in proportion to new sales.

The factors involved in this increasing number of transactions not part of the new sale will operate to change continually the influences on the market for parts, accessories and for new motor equipment. Up to the present, the actual character of the new vehicle and the things used in connection with it as standard equipment have operated to influence greatly the entire market for these products, regardless of the character of the car with which they were to be used.

As the number of transactions in used cars becomes proportionately greater and the matter becomes more stabilized, the influence of the new car upon the products to be used with these vehicles, will have a smaller effect on the market or the merchandising necessities.

The service development will be affected to a very notable extent by these changes. Demand for additional service facilities will continue to be heard long after the number of establishments for the sale of motor cars is entirely adequate. These service facilities will involve a larger and more comprehensive repair department, as the used car will require more extensive and careful repair the older it gets. Similarly, the larger number of changes in ownership will call for more extensive overhauling and repair.

If the automobile business follows the lines of progress displayed by other industries dealing with machines, it is to be expected that the average life of the vehicle will increase, so that there is a tendency for the user to operate it for longer periods without replacement. These tendencies may be summarized as follows:

Used Car Transactions Mounting

Used car transactions tend to increase at a higher rate than new car sales.

Service requirements for the maintenance of used cars through their life, impose the addition of larger service facilities than those required for the maintenance of new cars through the limited period of service follow up.

The amount of repair and service tends to grow as the car reaches the limit of its usefulness, so that during each year of its life the amount spent for service is likely to be larger.

Equipment required for the adequate repair of used cars is larger than that required during the first year of car life and the cost of service bears a definite relation to the character and amount of the equipment which can be usefully employed in this direction.

This condition affects the car manufacturer, because it places his sales in a different relation to the whole field of sale and distribution, so that the entire growth of the distributing organization is altered in its significance.

The sale of service, parts, accessories and supplies grows in proportion to the number of cars in use so that the supply departments, parts stocks, service facilities and repair equipment are required in proportion to the total number of vehicles running and in accordance with the average age of the vehicles themselves.

New car departments will be governed more and more by the number of cars required for replacement and less and less by the new buyers coming into the field.

For any one city or town in the United States, the new car transactions will involve less proportion of the total business done in that place and consequently the

"THE profit and advantage of new car sales have been entirely overemphasized, so that the other elements entering into the business of automotive retailing have been overlooked to some extent, except as the car owner has forced consideration of them by his insistence upon them.

"This is not the fault of the retailer. It is due to the rapid growth of the business, the activity of the manufacturer and to the changing conditions in the field."

automotive retailer will secure less of his total income from such transactions.

The authority and influence of the retailer will depend more and more upon his ability to serve the car owner in other things beside the sale of new cars and as a consequence the value of the retailer to the manufacturer as a sales outlet will be affected by the same conditions.

The automobile retailer has not been making money lately, at least to the extent the volume of his business would demand. In fact in far too many cases he has been lucky to come out even despite the great volume of his business.

The profit and advantage of new car sales have been entirely overemphasized, so that the other elements entering into the business of automotive retailing have been overlooked to some extent, except as the car owner has forced consideration of them by his insistence upon them. This is not the fault of the retailer. It is due to the rapid growth of the business, the activity of the manufacturer and to the changing conditions in the field.

Retailers Show Adaptability

As a matter of fact, the present character of the retailers in the automotive field is a very remarkable tribute to the adaptability of the average individual to new requirements.

It is only a few years since the number of cars totalled just over a million and the number of new cars reached 500,000. In those few years the total number is ten times as great and the production five times as much. At such a pace it would be a miracle if the retailing field were adequate for all the necessities which force themselves on the attention as the business grows.

It is to be noted that the ratio of registration to production growth is growing, so that the actual necessities of business connected with the cars in use is growing much more rapidly than the necessities of business concerned with the new car sales. Both of them have grown at such a pace that it has been difficult to keep up with the requirements, so that the significance of this tendency has been overlooked.

It is difficult to get the attention of the manufacturer for such considerations when his factory is behind the orders and it is equally trying when the retailer is overwhelmed with the demands of users, to get him to sit down and find out where he is going.

Nevertheless, every indication points to the much more rapid growth of all business necessities connected with the maintenance and operation of the cars already in use and the important effect this must have upon the entire structure of retailing in this field.

Must Keep Abreast of Conditions

This point of view should be kept in mind in all examinations of the retail field so that the developments which seem confusing, otherwise, can be defined in the light of this tendency. The growth of independent service stations has been permitted to warp the judgment of more than one manufacturer, because he had not measured the tendencies and therefore the problem to which this development was an attempted answer.

In this connection the car manufacturer will do well to consider the

> Development of selective methods of securing dealers, so that those he secures may be more thoroughly fitted to the requirements of his organization and plans of distribution.
>
> Encouragement of the retailer in the proper departmentalizing of his business so that he may be prepared to get the maximum of advantage from the automotive business in his locality.
>
> Necessities involved in the very large number of used car transactions and their effect upon the dealers' volume and profit.
>
> Cost of present changes in the retailing field and the reason for the mortality.
>
> Part played by replacement business in the profit possibilities of the retailer.

These problems all affect the position of the car manufacturer and his marketing program. They are not likely to be solved by any arbitrary programs of factory control, but the manufacturer can take advantage of them in laying out his plans so that his new car sales are well founded against the probable development of more severe competition in the future.

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"Encouragement of the retailer in the proper departmentalizing of his business so that he may be prepared to get the maximum of advantage from the automotive business in his locality."

Supercharger Fitted to Mercedes

THE German Mercedes Co. is now said to be in production on a new passenger car chassis having a four-cylinder, 80 x 130 mm. engine, rated at 10-40 hp., and fitted with a supercharger, positively driven by bevel gears through a clutch on the crankshaft. The clutch is inter-connected with the accelerator pedal in such a way that the supercharger is in operation only when maximum power output is required.

The induction system is so arranged that the carbureter draws its air from a stove surrounding the exhaust pipe, directly through a pipe passing between the cylinders of the engine, except when the supercharger is in operation. When the supercharger clutch is engaged, however, the direct air supply is shut off and all air to the carbureter is drawn from the stove, through the blower, and forced into carbureter through another opening, the butterfly valve in the direct induction type having been closed.

Except for the engine, the new chassis is understood to follow quite closely along lines characteristic of the Mercedes chassis heretofore produced. The cylinder block of the engine is said to be built up from steel forgings welded together. Overhead valves are operated by an overhead camshaft driven by bevel gears. Forced lubrication by a special piston pump is employed.

A double, leather-faced cone clutch and four-speed gearset convey the power to the propeller shaft which is inside the torque tube attached to the rear axle. Final drive is by bevel pinion and two crown gears, one of which is attached to each axle shaft. Front springs are semi-elliptic, and rear springs are of the cantilever type, arranged inside the frame.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE
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New Distribution Practice

SOME executives in discussing the relative merits of distributors and factory branches have proposed the establishment of factory branches which shall have no retail function. The plan would be to have small executive offices and warehouse facilities at important points throughout the country. Each branch office would control dealers in its territory, including a dealer in the city at which the branch office is located. The branch would act purely as a distributing organization.

A plan with some of these characteristics has been put into operation by a Chicago distributor. This distributor has dropped his retail departments and conducts his operations from an office building.

He maintains maintenance, parts and other usual service for his dealers.

But his plan has other unusual features. As there is one favored location in his territory for a retail store, he has organized a stock company to conduct this store and his dealers are stockholders. He operates an accessory jobbing concern that sells to his dealers accessories best suited to the particular car which he sells. He has organized a finance company for his dealers in which the latter are stockholders.

Automotive distribution practice is still in the experimental stage, so no final appraisal can be made of these new methods at the present time. They are interesting, however, simply because they are different and their operation will bear watching.

Trucks for Terminal Haulage

RAILROAD and automotive interests seem to be agreed as to the feasibility of using trucks in terminal haulage. Both parties think that motor vehicles should be employed more extensively in this work.

But there is some difference of opinion about who ought to run them. Some authorities think the railroads should own and operate the vehicles used in such service. The railroads are not enthusiastic about the proposal. W. H. Lyford, vice-president of the Chicago & Eastern Illinois, recently spoke very strongly against asking the railroads to go into the trucking business.

Strangely enough, a tremendous fight was precipitated in England a while ago because the rail carriers were trying to control the operation of vehicles used in terminal haulage. They succeeded to a large extent and apparently are providing good service.

Whatever agency operates trucks used to relieve railway terminal congestion, the automotive industry will profit. Its profit will be in the form of better shipping service as well as in greater sales.

Service Experience Helps Design

WHERE do ideas for changes in passenger car design come from? Sources are different today than they were twenty years ago. Experience of users was of limited value in the early days because that experience itself was limited.

Today accumulated reports of road performance can give an excellent basis for the designer to work on. The difficulty is to collect the data necessary.

If a manufacturer had a complete service record of all his cars, he would have invaluable material for design purposes. Since this is not possible, he must rely on the best information that can be collected from his service stations.

The Yellow taxicab is an excellent example of a vehicle which has been developed largely through a careful study of operating and maintenance experience. A close alliance between an operating and a manufacturing organization made it possible.

Similar facilities for obtaining detailed information about maintenance and operation are not available to the ordinary passenger car manufacturer, and his vehicle is required to operate under more varied conditions. But the idea of correlating service experiences into future design is worth adapting.

Detroit Is Ready for Emergencies

CAREFUL inquiry among motor vehicle and parts manufacturers in the Detroit district indicates that they are fully alive to the probability of a midsummer decline in sales. Opinion differs widely as to the extent of the falling off which may be expected, but makers profess to be ready for any emergency. Their finances and inventories are ship-shape and they don't see how anything serious can happen to them.

Even if some of their statements are discounted, the situation is gratifying. Lessons learned in 1920 have not been forgotten. Inventories are small and fairly well balanced and assets are liquid. Except in isolated cases no plant expansions are under way, which probably is the most important factor of safety.

Generally speaking, order books are full, but sad experience has taught that in times of stress many persons regard orders merely as "scraps of paper." Production is no more than adequate to meet current demand, however. Several of the larger passenger car companies are far behind in deliveries and none of them has been able to accumulate a surplus of cars. Much the same conditions prevail in the truck field.

In a good many cases output has been limited by inability to obtain an adequate supply of materials. That may be one of the reasons why inventories are relatively small, but it is equally likely to make for profits in the long run.

So far as profits are concerned, they have been reduced of late by rising material costs, but production economies have left a substantial margin. Parts makers' earnings are materially larger than they were last year because of higher prices. All the large companies are in a very strong cash position and are practically independent of the banks.

Altogether the picture is a pleasing one for it shows that unless manufacturers run afoul of their own good judgment they have nothing to fear from a sales decline, even if it is of large proportions. Their houses are pretty well in order.

There are a few bad spots, however, One of them is that while all manufacturers declare they are ready for emergencies, a good many of them seem to feel that even if other makers are hit pretty hard by a falling off in business, they are so strong with the public nothing unpleasant can happen to them. If they persist in that attitude and keep on turning out their products at full speed after general prosperity begins to ebb, they may get into trouble.

Another problem to which some manufacturers do not seem to have given enough attention is the position their dealers will be in if business slows up. Used cars already are beginning to pile up and a serious jam is expected within two months. It will be serious for the dealers because their position is not so strong as that of the vehicle makers and their profits have not been large even with a record breaking business.

Most makers profess to be confident that their dealers are "buying 'em right" and that they will get through without difficulty, but they are likely to suffer a rude jolt when the pinch comes.

Not only are dealers likely to suffer severely in the coming summer because of used cars, but their troubles may work back to the factory to a greater degree than is expected. No matter how strong demand for new merchandise may be they can't buy it if a large part of their assets are tied up in old cars.

This is a point which should be given serious consideration in making plans for the third quarter.

NO LET-UP IN SALES APPARENT YET

REPORTS for April continue to show large sales and the estimates of dealers in most of the territories indicate anticipations for similar conditions through May. Production volume shows some increase over March, which was the largest month previously reported. There are signs in some of the territories of a slight slackening off during the latter part of the month and in some of the reports the accumulation of used cars is noted.

In general the situation is good with the exception of prospective profits. Many dealers still complain that they are not making a sufficient amount of profit out of the volume and the increase of cost in the manufacturing field is limiting the profit per unit to the factory.

The raw material situation is much more acute than it was at the beginning of April. Prices of products used largely in the manufacture of cars and trucks have risen rapidly during the last month and now show an index figure of 188. During the same month general commodity prices have changed very little, so that raw materials used by the car and truck manufacturer are considerably out of line with the general prices.

Labor continues high and there is no present indication of a decline in the wages to be paid to the workers in the automotive factory. Raw materials are responsible for a large share of the manufacturing costs and a rise of 20 per cent in the cost of these items in one month is important. The price question undoubtedly has its effect on the volume, so that the question of raw materials and labor is hooked up with the extent of future production in a very practical way.

Here and there are indications of an accumulation of used cars which will tend to back up on the new car sales unless the summer months enable the dealer to get clear of the stock. These indications are slight as yet but they should be heeded by the manufacturer who is somewhat slow in discovering the direct relation between the new car flow and the future new car sale.

Stock values have not increased during the month, but have fallen off slightly. This decline is due principally to the parts and accessory stocks which have not kept the steady position held by the motor stocks and some of the rubbers.

Truck business continues to gain steadily and it is to be expected that this part of the business will go on without feeling the seasonal slump, so long as the building programs and other industrial activities are working at full tilt. Farm buying is not coming to the front to the expected extent in some of the territories, although the reports from the Northwest are better in this respect. The cotton states are feeling the effect of the good prices for cotton and the small margin of carryover, so that the reports from these territories are uniformly good.

In general the sales situation continues to be optimistic for the continuance of large requirements in May and June. After that there is some expectation of a falling off through the summer. The most significant item of the month is the growth of manufacturing costs, foreshadowing adjustments of prices.

Conditions in chief distributing centers as reported by correspondents of AUTOMOTIVE INDUSTRIES are as follows:

Distributing Centers Offer Good Outlook for May Business

New York

NEW YORK, May 2—April proved to be a record breaking month in passenger car sales in the Metropolitan territory. New cars registered in ten counties in and around New York numbered 6065 for the first two weeks of April as compared with 2518 for the first two weeks in March and 9652 for all of March. With deliveries going forward at top speed in the last half of April, the indications are that final registration figures, which are not yet compiled, will be well over 12,000.

Distributors and branch managers have not yet discovered any slackening of demand incident to the approach of the summer season and the outlook is as bright for May as it was a month ago when April business opened. Sales have been just as heavy, comparatively, in Brooklyn and Newark and the smaller outlying cities and towns.

Throughout the entire Metropolitan area there is very little indigestion of used car merchandise, due to more conservative buying combined with a ready used car demand which is becoming stronger every day with the approach of warm weather.

A general census of the situation shows business better than it has ever been in this territory and prospects until mid-year, at least, excellent. The truck market is steadily improving, showing a gain every month since the first of the year.

Columbus

COLUMBUS, OHIO, May 2—Distributors and retailers of automobiles in Columbus and central Ohio territory report sales of new cars fully up to the records of the past month and, in many instances, above them. There is no appreciable falling off in demand in any way, with the possible exception of the highest priced lines, in which it is showing a slight hesitancy.

Used cars are accumulating to a certain extent and some sacrifices are being made to dispose of them.

Cars selling between $800 and $1,500 are having the best demand, excepting the low priced lines. Closed models average about 40 per cent of the sales.

There is practically no stocking of cars in this territory, as dealers are having difficulty in getting a sufficient supply to meet the demand. Country districts which have not been among the best purchasers are showing up slightly better.

Seattle

SEATTLE, WASH., May 2—Seattle and Puget Sound retailers report a continued strong demand especially for standard makes. There is no sign of any let up in buying, and dealers look for this strength to continue, due to the excellent employment and business conditions. Dealers in cars of popular makes report deliveries under sale. The agricultural section demand is good, and trucks are selling well.

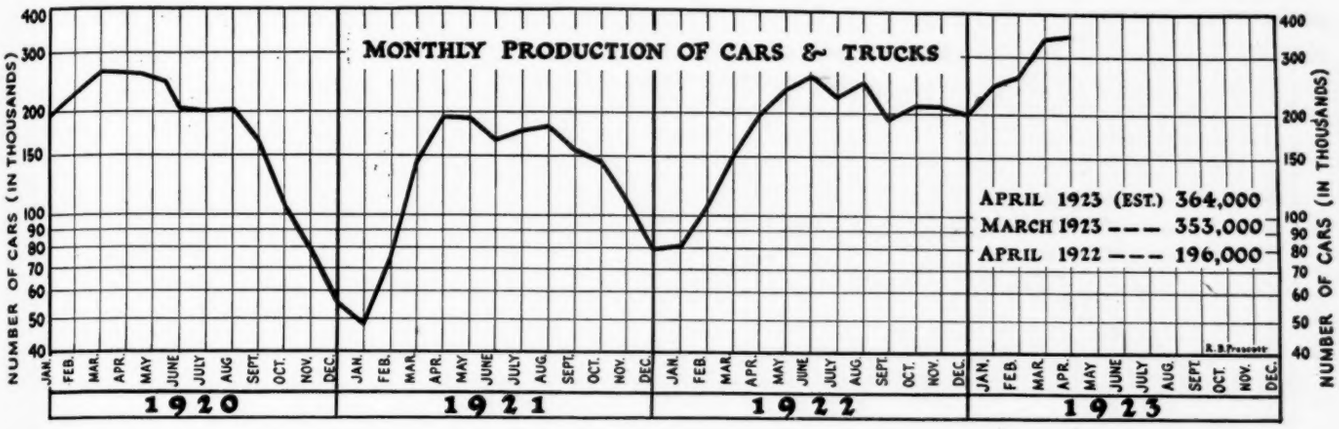
Omaha

OMAHA, May 2—Trade conditions in this territory are at the highest possible mark. Retail sales are forging ahead of last month. Dealers are running short of certain models of the higher priced cars, but a few dealers are stocking those of lower price. The recent heavy downfall of snow packed the ground, making spring ploughing a tractor job. Tractors are going fast.

The smaller county seats of Nebraska are staging automobile shows, and a few of the small towns are holding tractor exhibitions which tend toward increased sales.

(*Conditions in other cities on page* 993)

APRIL PRODUCTION TOTALED 364,000



All Records Broken by April Exceeding March Output Mark

NEW YORK, May 1.—Estimates from shipping returns made by the National Automobile Chamber of Commerce place April's production of motor vehicles at 364,000, which is a new record for the industry. This output exceeds by 3 per cent the high water mark of March, when 353,017 cars and trucks were turned out, and surpassed April 1922, by 66 per cent.

This result was not at all unexpected, for even in the early days of April it was apparent that the previous record would go, for April production started at a higher clip than did March. The high mark was made despite the fact that there were only twenty-five working days in April as compared with twenty-seven in March. This gives a daily average production of 14,560 for the month just ended.

Driveaways Fall Off Slightly

Carload and boat shipments for April both show an increase over March, but driveaways last month fell off slightly over March, testimonial of the fact that railroad service is improving.

With 243,083 in January, 276,465 in February, 353,017 in March and 364,000 for April, the first third of the year finishes with a production mark of 1,236,565, a production greater than the whole year of 1918, when 1,153,637 vehicles were turned out.

The daily average for the 100 working days in the first four months of this year was 12,219, which, statistics show, is larger than the entire production for the year of 1903 when 11,000 vehicles were manufactured.

The 364,000 monthly record established by March, is more than the yearly production for the industry up to 1912, that year showing 378,000.

That this production pace will be maintained for the next two months is predicted by leaders of the industry, who, however, expect a seasonal decline after June, possibly not until July 1. This expected decline is looked upon, though, as a safety valve for the industry. Low prices, good general business and motor transport shortage account for the unusual demand for motor vehicles at this time, say the leaders.

April Exceeded March, Best Previous Month in Production History by Three Per Cent

NEW YORK, May 1—Shipping figures compiled by the National Automobile Chamber of Commerce give an estimated production for April of 364,000 cars and trucks, the greatest monthly production in the history of the industry. It is an increase of 3 per cent over March.

The following table gives the statistics for January, February, March and April and for the months of 1922 and 1923:

	Output 1923	Output 1922	Carloads 1923	Carloads 1922	Driveaways 1923	Driveaways 1922	Boat 1923	Boat 1922
January	243,083	91,109	33,900	15,357	31,400	7,479	800	143
February	276,465	122,366	35,700	19,636	42,760	10,173	900	180
March	353,017	172,720	44,350	27,753	62,619	16,917	1,914	560
April	364,000	219,558	46,360	31,334	60,000	22,381	3,000	2,960

Factory shipments for the other months of 1921 and 1922 and output for 1922 follow:

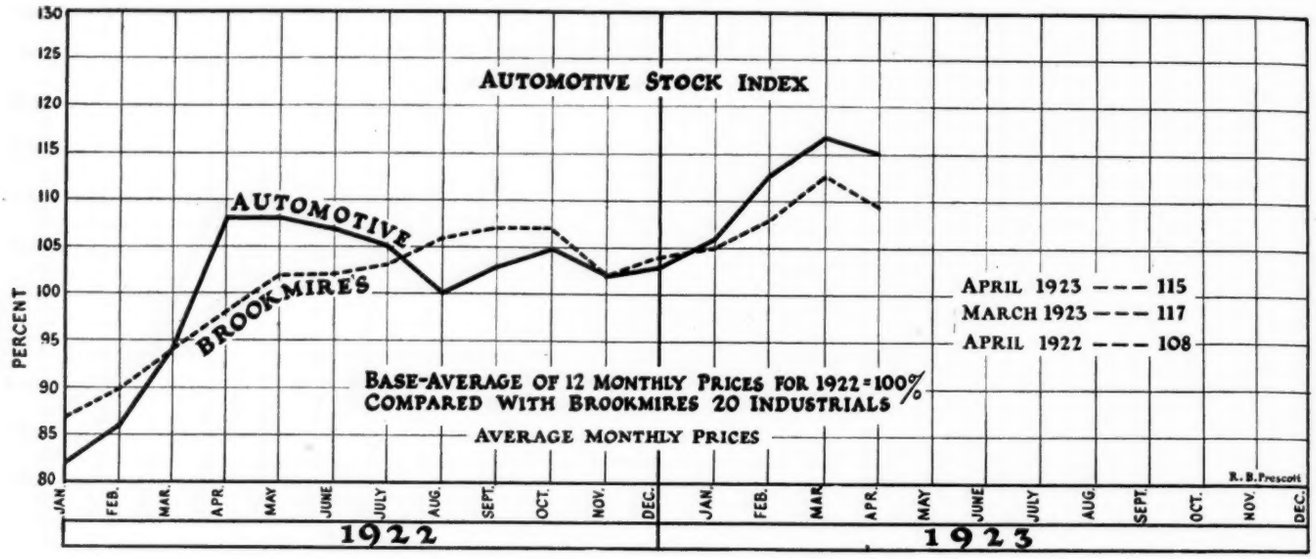
	Output 1922	Carloads 1921	Carloads 1922	Driveaways 1921	Driveaways 1922	Boat 1921	Boat 1922
May	256,219	18,608	33,416	15,193	28,827	2.381	7,406
June	289,011	20,269	34,230	18,834	33,857	3,947	7,737
July	246,607	19,514	29,116	15,533	28,100	3,726	7,030
August	272,589	20,758	32,814	15,218	36,754	3,595	10,096
September	206,849	19,002	25,950	13,840	30,055	2,959	8,002
October	237,611	17,808	26,980	12,971	33,320	2,226	7,040
November	236,887	14,264	27,232	10,528	27,376	1,402	5,070
December	227,319	12,100	26,900	7,500	27,500	134	1,300

Motor vehicle production segregated as to cars and trucks is as follows:

1922	Cars	Trucks
January	81,693	9,416
February	109,171	13,195
March	152,959	19,761
April	197,216	22,342
May	232,431	23,788
June	263,027	25,984
July	224,770	21,837
August	248,122	24,467
September	187,661	19,188
October	216,099	21,512
November	215,284	21,603
December	207,269	20,050
1923		
January	223,706	19,377
February	254,650	21,815
March	318,424	34,593
April	*328,000	*36,000

*Estimated.

AUTOMOTIVE STOCKS KEEPING IN LEAD



New York Exchange

	April 3	May 1
Ajax Rubber	13⅜	13¼
American Bosch	50½	48½
Am. La France	12¼	12
Am. La France pfd	....	90
Auto Sales pfd	....	12½
Brunswick	2¼	....
J. I. Case	....	94
J. I. Case pfd	79	78
Chandler	70¾	67¾
Continental Motors	9½	9¼
Electric Stor. Bat	64	62½
Emerson Brantingham	5	4⅞
Emerson Brantingham pfd	28	26
Fisher Body	183	162
Fisher Body pfd	120	115
Fisher Body rts	18	16½
Fisher Body of Ohio	99	99
Fisk Tire	14	12⅝
Gardner Motors	....	14
General Motors	143¾	17⅛
General Motors pfd	85½	87
General Motors 6%	86¼	87¼
General Motors 7%	100¾	102¾
Goodrich, B. F.	38½	36
Goodrich, B. F., pfd	90	89½
Goodyear Tire pr. pfd	96⅝	96⅝
Goodyear Tire pfd	....	60½
Gray & Davis	....	12
Inter. Harvester	....	88
Inter. Harvester pfd	....	111
Hayes Wheel	39½	42⅛
Hendee Mfg	21½	18
Hudson	29⅞	27⅞
Hupp	27⅞	26¼
Kelly-S Tire	59½	57½
Kelly-S Tire 6%	....	85
Kelly-S Tire 8%	105	100
Kelsey Wheel	107	104
Kelsey Wheel pfd	....	100
Lee Rubber	28¾	29
Mack Truck	85⅛	86½
Mack Truck 1st pfd	96¾	94
Mack Truck 2nd pfd	....	86
Marlin-Rockwell	12	10
Martin-Parry	32¾	35
Maxwell Motors A	57	55¼
Maxwell Motors B	18	19
Moon Motors	23½	27
Mullins Body	25¼	23¼
Mullins Body pfd	....	88⅛
Nash Motors	108¾	106
Nash Motors pfd A	....	98
Packard Motors	15	14¾
Packard Motors pfd	....	92
Parish & Bingham	13	11¼
Pierce-Arrow	13	11½
Pierce-Arrow pfd	31⅞	29
Pierce-Arrow pr. pfd	70	66½
Reynolds Spring	23½	27
Spicer Mfg	22	21½
Spicer Mfg. pfd	....	92⅛
Stewart-Warner	120⅜	119¾
Stromberg Carbureter	86¾	84
Studebaker	122½	121¾
Studebaker pfd	113	114
Timken R. B	42	41⅝
U. S. Rubber	62	60½
U. S. Rubber 1st pfd	103⅛	102½
White Motor	56⅝	54½
Willys-Overland	7½	7⅝
Willys-Overland pfd	60⅞	67¼
Wright Aero	9½	10¼

Cleveland

	April 3	May 1
Firestone	83	....
Firestone 6% pfd	95½	....
Firestone 7% pfd	97	....
Goodyear	....	15⅞
Grant Motors	⅛	....
Jordan Motors	285	....
McGraw Tire pfd	½	....
Miller Rubber	103	94
Miller Rubber pfd	104	105
Peerless Motor	....	49
Stearns, F. B	22⅝	....
Torbenson Axle	27¾	30
Victor Rubber	6	....
Winton Motor	24¾	....

Chicago

	April 3	May 1
Bassick-Alemite	37½	37¾
Borg & Beck	31½	30⅛
Continental Motors	9½	9¼
Earl Motors	....	⅞
Gill Mfg	....	27½
Hayes Wheel	40	42¼
Hupp	27½	26¾
Mitchell	2	¾
McQuay-Norris	....	25
Reo	16⅝	19¼
Stewart-Warner	121½	120½
Yellow Mfg	280	277

Detroit

	April 3	May 1
Auto Body	3½	....
Columbia	3¼	2⅜
Columbia pfd	3½	....
Continental	9⅝	9⅛
Edmunds & Jones	26¾	29¼
Federal	27½	28½
Ford of Canada	456	430
Hall Lamp	26½	28
Hayes Mfg	4⅜	4
Hoover	60	11¾
Michigan Stamping	19¼	18⅞
Motor Products	98½	103
Motor Wheel	11½	12⅛
Murray Mfg	17⅝	22
Packard com	15	14¾
Packard pfd	94	92½
Paige	21¼	23
Reo	16⅝	19
Reynolds Spring pfd	....	85
Timken Axle	12⅜	13¼

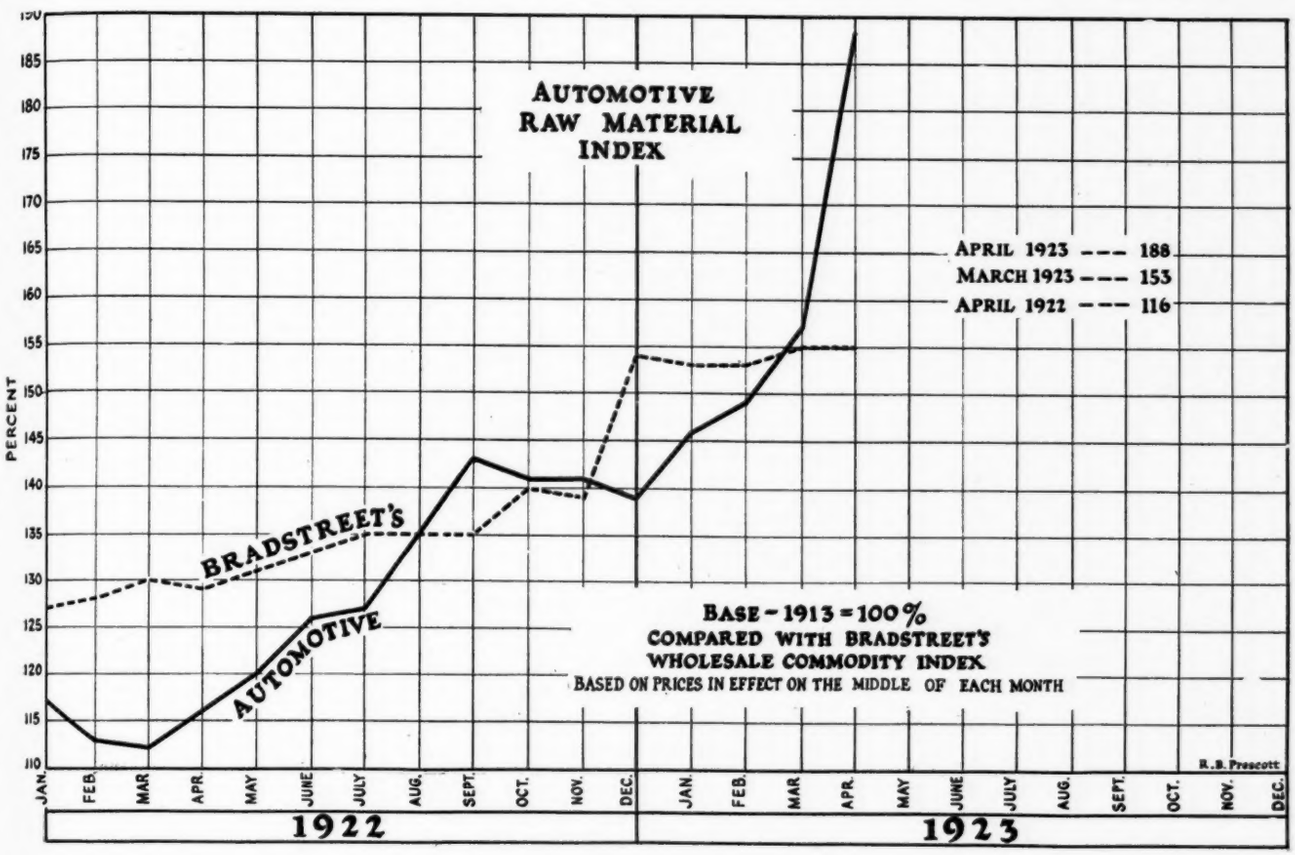
New York Curb

	April 3	May 1
Cleveland Motors	29½	31¾
Durant Motors	59½	53½
Ford of Canada	450	435
Gardner Motors	13⅞	....
Goodyear Tire	15¾	15¾
Hood Rubber 7s '76	101⅝	....
Mercer Motors	1¼	....
Motor Wheel	11	11¼
National Motors	1	1½
Paige-Detroit	21½	....
Peerless Motors	59¾	48
Reo	16¾	18⅞
Republic Rubber	5	....
Springfield Body	50⅝	....
Stutz	18¼	18½
Timken-D Axle	12	12⅜
Torbenson Axle	27⅜	....
Willsy Corp. 1st pfd	9	8

Boston

	April 3	May 1
Gardner Motors	13¾	....
Gray & Davis	12¼	12⅜
Hood Rubber	59½	58½
Mercer Motor	1¾	1
R & V Motor	....	....
Simms Magneto	2	....

MATERIAL COSTS MAKE BIG ADVANCE


AUTOMOTIVE RAW MATERIAL INDEX
APRIL 1923 --- 188
MARCH 1923 --- 153
APRIL 1922 --- 116
PERCENT
BRADSTREET'S
AUTOMOTIVE
BASE - 1913 = 100%
COMPARED WITH BRADSTREET'S WHOLESALE COMMODITY INDEX
BASED ON PRICES IN EFFECT ON THE MIDDLE OF EACH MONTH
R.B. Prescott
JAN. FEB. MAR APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1922
JAN. FEB. MAR APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1923

Satisfactory Sales Conditions Evident in Leading Cities

Chicago

CHICAGO, May 2—Increasing demands for labor, coupled with better wages in all lines of work is the reason advanced for the increasing number of sales in Chicago and vicinity. April, experiencing better weather, has found the demand for cars good. Especially good is the demand for used cars, many dealers reporting sales better than at any time in their history.

Automobile finance houses report loans to prospective car owners as increasing every day, and representative retailers in all sections of the city say that cash sales are by no means unusual today.

Extensive advertising by the factory branches and the dealers themselves are keeping sales at an exceptionally high pace.

Cleveland

CLEVELAND, May 2—The wholesale and retail automobile trade in the Cleveland territory during April continued at about the volume that marked March. The indications are that the present volume, which is entirely satisfactory, will continue for some time. There is nothing in the local industrial condition that would indicate there may be a falling off in sales in the immediate future. Men who have followed the trade for years are of the opinion that the seasonable hot weather buyer has not come into the market in full force. These dealers expect increased business the latter part of May and the greater part of June.

Rubber Tops Price Move Made in Raw Material

DETROIT, April 26—Price advances in raw materials used for the manufacture of automobiles from the low of 1921 to the high of 1923 show the following range of percentages:

Pig iron 64 per cent.
Iron bars 43 per cent.
Steel bars 78 per cent.
Shapes (structural) 78 per cent.
Sheets (blue annealed) 44 per cent.
Cold finished steel bars 66 per cent.
Cold rolled sheets 57 per cent.
Copper (lake) 42 per cent.
Tin 67 per cent.
Coke (at ovens) 81 per cent.
Aluminum 55 per cent.
Rubber 150 per cent.
Coal (at mines) 73 per cent.
Lumber 43 per cent.
Malleable 82 per cent.
Steel castings 68 per cent.

Milwaukee

MILWAUKEE, May 2—A week of fine spring weather following another belated snowstorm served to put passenger car trade into the most active condition known since early last June. All records for sales are going by the board among established dealers handling cars in practically every price classification. Warehouse stocks accumulated during the winter are virtually depleted by deliveries on old orders and the rush of new bookings.

Motor truck dealers are experiencing the best call for the heavy-duty types that they have known since early in 1920. Highway and general building construction is absorbing large numbers. Passenger bus business is excellent.

Buffalo

BUFFALO, May 2—Spring merchandising of automobiles here has been adversely affected by weather conditions.

Business during April did not measure up to expectations, the failure being attributed to the cold spring.

Dealers express themselves, however, as confident that May's business will more than make up for the backwardness of April.

(*Conditions in other cities on page* 1003)

MAY OUTPUT PROMISES NEW RECORD

Factories Watching Sales Field Closely

Any Sign of Slackening in Demand Will Result in Lowering of Operations

DETROIT, May 1—May production in the larger plants of the industry will run in excess of any month this year, it is predicted. In spite of record breaking production in the early months, sales executives declare dealers orders are running well ahead of factory output, so much so that the main factory difficulty is to maintain equable distribution of the product rather than find a market.

Though there is a general feeling in the industry that business is secure, it is notable that sales executives are spending a great deal of time on the road with the distinct intention of keeping in close personal touch with developments. Recession in buying undoubtedly will result in immediate curtailment of factory production schedules. That May schedules will run in excess of early months may be taken as a definite indication that recession is not yet in sight.

Dealers Being Shifted About

Inability of large producing companies to meet dealer demands is resulting in a shifting about of dealers, especially among the community and subdealer organizations in the large centers. This is mainly a recrudescence of the annual difficulty in which the distributor is guilty of failing to provide amply for the requirements of his retail organization. As a result, companies with possibilities of greater factory output are signing up these available local dealers and the condition also is helping smaller factories to expand.

A condition in the present sales market to which the attention of the industry might well be directed is that factory branches of several large companies are declining all business in which trades are involved, but are turning over this class of business to their subdealer organizations. This does not necessarily mean that the used car market is caught up, but that the direct branches are avoiding this business to concentrate on clean sales.

A further indication of the used car situation is found in the fact that factories, which hold dealers to a strict accounting on competitive business in their territories, gladly sacrifice business in which unfair allowances on tradings are sought. As these factories are at the very top of the big companies, it must be accepted that the business their dealers are getting is on a sound, legitimate basis.

The most serious part of the used car situation is the difficulty in moving cars whose rank is about one above the junk heap. Used cars ranging in price from $500 up find ready market, but there is no buying in the earlier vintages. The latter part of the year will find many of these old cars being scrapped with consequent loss to dealers. Apparently this is the only way they can be converted into money.

Ford Motor Co. schedules will continue on the 6500 a day basis set up in April, with back orders for approxi-

(*Continued on page* 1004)

Business in Brief

NEW YORK, May 3—There is evidence of a slackening in industrial expansion in the decline of wholesale buying and easing off of prices in many lines. Manufacturing continues at a high level, and little effort is now being made to secure special advantages on shipments.

Improvement in weather conditions has brought about better conditions in the retail trade, which is still very irregular. Reports from the western part of the country are more cheerful, but there are signs of price resistance in the agricultural sections which may mean minimum buying until the next harvest.

Steel production continues at record rate, with buying for future needs slackening. Requirements continue urgent. The United States Steel Corp. reports net earnings higher than at any time since 1920. Scrap and non-ferrous metal prices decline.

Demand for workers far exceeds labor supply. Building activities and industries using a large amount of common labor have drawn labor from a wide radius.

Car loadings for the week ending April 14 aggregated 946,759 cars, an increase of 50,992 cars over the previous week. This is the peak loading so far this year.

Movements in the stock market were irregular and largely professional. Publication of the Steel Corp.'s favorable report did much to stimulate the market and cause a rally. Bonds remained quiet with foreign securities exceptionally strong.

Checker Cab Builder Buys Handley Plant

Also Acquires Dort Body Factory at Kalamazoo—May Make Handley Car

KALAMAZOO, MICH., April 28—The Checker Cab Manufacturing Co., Chicago, has closed negotiations for the purchase of the plant of Handley Motors, Inc., on North Pitcher Street, and the Dort Motor Car Co.'s body plant, South Pitcher Street, and will move its entire establishment and general offices to this city, with the expectancy of being in operation in thirty days.

James I. Handley, president of Handley Motors, Inc., back from New York, where the negotiations were completed, states that so far as his company is concerned, the deal was on an all-cash basis.

Referring to plans for the Handley car, Handley said:

A deal is now under consideration and will probably be worked out, whereby the Checker Cab Manufacturing Company will build the Handley car, of which I will direct the sales. The Handley Motors Company is now practically free from debt and has sufficient cash in bank to operate without any extensive financing at this time.

Had the deal to sell our plant to the Checker Cab Manufacturing Company failed to materialize and they had allowed their option to lapse on Friday, I would have immediately sold to another automobile concern, fully financed and ready to start immediately. I have in my pocket their signatures to an agreement to take the plant. It is possible I may be able to induce them to come to Kalamazoo anyway I intend to work to that end.

Maximum Truck Wanted Plant

During the past two weeks, C. S. Campbell, president of the First National Bank, has been in frequent communication with President Hofstetter of the Maximum Truck Co., Kansas City, who was also desirous of buying the plant.

By the transaction Checker Cab acquires from Handley Motors the main factory building, 800 by 80 ft. in dimension, the heating plant and thirty-eight acres of land that can be tapped by switch tracks from three lines of railroad. All the factory equipment and machinery is also taken over, but none of the inventory or receivables.

This division will be used for the manufacture and assembling of chassis exclusively.

The property purchased from the Dort company includes a four-story body plant containing 200,000 sq. ft. of floor

(*Continued on page* 1002)

GOOD FULL YEAR, REEVES PREDICTS

Production Decline May Come with July

Plants, However, He Says, Will Continue to Operate on Substantial Programs

DETROIT, May 1—Alfred Reeves, general manager of the National Automobile Chamber of Commerce, here for the monthly meeting of the Chamber in this city tomorrow, took the general public into his confidence tonight in an address over the *Detroit Free Press* radio and discussed the present situation so far as the automotive industry is concerned.

Reeves started his talk by announcing the April production figures of 364,000 motor vehicles and told his audience that the schedules for May and June also are big, but after that a seasonal decline may be expected, although substantial production figures are certain for the last half of the year.

"When you stop to think that during the past twelve months the automobile industry has produced more than 3,208,000 motor vehicles, of which about 10 per cent have been trucks, and that its 38,000 dealers have, in addition, marketed approximately 1,300,000 used cars or a total sale of 4,500,000 motor vehicles, many will question whether this same pace can be maintained during the remainder of 1923," Reeves said.

Decline Would Be Safety Valve

"The record selling which has been going on during the past four or five months is a natural result of the increasing need for motor transportation in this country. Some part, however, came from the fear that prices are going to advance and that it is better to buy now than later. In view of the record production pace of late, a natural seasonal decline may be expected around July 1 or July 15. Not alone is it expected but it should come as a safety valve on the business.

"No one can expect that all months will be like March or April. However, the last half of the year should see a very substantial production, although not as great as during the first six months. While this seasonal decline may possibly be a little sharper than normal, it should not be anything like a slump."

Continuing, Reeves said:

The open or touring car season opens today. It will bring good sales, although the season may be comparatively short. The value of the used open cars will continue downward and dealers should promptly dispose of cars taken in trade.

A most important factor is price. Car prices are very low and manufacturers would like to keep them low. Labor and material costs are rising and increases may be necessary. Any general increase in prices may be expected to substantially slow down sales and bring about a decrease in production.

Buying by the farmers will be heavier. We must continue to replace many of the 3,000,000 cars made in 1916 and 1917 that now are wearing out.

Labor continues to be fully employed at good wages. All lines of industry are prosperous. Building is still on a record scale.

A limiting factor in production during the next three months is a shortage of materials, particularly closed bodies. Plate glass seems to be the real trouble.

Our monthly survey of twenty different sections of the country shows a continued demand for cars among the dealers, with the used car market much healthier than this time last year and dealers' new stocks less than last year. The used car, however, will continue the limiting factor in new car sales.

Exports continue to increase. We shipped more than 10,000 cars and trucks during the month of February. I look for our foreign business soon to be at least 15 to 20 per cent of our total.

Concluding, Reeves said:

"The outlook for the truck industry is the best in five years. Production in March was 62 per cent greater than February. The 5-ton truck had the greatest increase, although in numbers the light truck outstrips the field. Trucks were bought for replacement as well as by new customers. This is the result of a demand for more transportation than the railroads can supply."

Tariffs and Shipping Costs Are Holding Back Sales of Imported Parts in England

By Harrie T. Hickey
Advisory Staff of the General Motors Corp.

DETROIT, April 30.

COMING away from England after a lengthy visit investigating service conditions in that country, particularly from a General Motors' viewpoint, but with regard to the entire industry, I must say that on the whole I found things very satisfactory and, with the exception of a number of smaller details, very much on a par with servicing as carried out in the United States.

The English mechanic, as I found him, is a very capable man and as a general rule knows more about the use of tools than the average run of men employed in mechanical work in the United States. English mechanics are quick to learn and adapt themselves to new methods rapidly. American methods and tool developments are followed closely, and are put into operation as rapidly as found practical to their local conditions.

Probably the greatest field for improvement abroad is the construction of more modern service stations. The larger part of service stations in England are located in buildings from 100 to 600 years old, which have been made over to meet requirements. Floor levels in many of these vary with additions that have been built, preventing installation of service methods possible only on unbroken levels.

One of the aims of General Motors is to seek the erection of better service plants abroad and in this we expect the hearty cooperation of our large distributors. When these are built I am confident that, with their skilled workmen, the mechanical end of the service work there will be on a thoroughly efficient basis.

American car manufacturers are not getting the percentage of replacement parts business that the volume of car business warrants. This is due to the fact that the parts can be built in England at present more cheaply than they can be imported under existing tariffs and shipping costs. Operation of cars is not affected by the use of their parts, but the fact remains that there is a large field for parts business if means can be found of landing the parts at lower prices than they can be made.

The business situation in England is improving and may be compared with conditions in this country about eighteen months ago. There is a large amount of unemployment and the dole system, though necessary, is harmful in that it has the effect of keeping back a quicker readjustment of general industrial conditions.

American cars are selling in competition with the home product and are consistently finding a larger market. The idea that they were thrown together, because of large production, has been disabused by the showing of educational films and dissemination of literature, and there is no discrimination from this viewpoint. As long as American cars are offered for sale in colors other than black they will find buyers. The English buyer will not buy black cars.

Studebaker Netted $6,170,971 in Quarter

Profits Show Increase of 51.6 Per Cent Over Same Period of Last Year

SOUTH BEND, IND., April 30—Directors of the Studebaker Corp. today declared the regular 1¾ per cent dividend on the outstanding preferred and 2½ per cent on the outstanding common stock, payable June 1 to stockholders of record May 10.

Reporting on the quarter just ended, the corporation states that in the first three months of the year 38,211 cars were sold, as compared with 22,801 in the same period last year, an increase of 67.6 per cent, with net profits of $6,170,971, against $4,069,848 last year, an increase of 51.6 per cent.

Both the month of March and the first quarter established monthly and quarterly sales records by the corporation. Profits were maintained by increased volume, which offset through overhead savings increased costs of materials and wages. All plants now are reported in capacity operation, with sales absorbing output. Business in the second quarter promises to exceed that of the first quarter.

Following are the current assets and liabilities:

Current Assets:	March 31, 1923	Dec. 31, 1922
Cash	$12,578,797	$15,174,395
Sight drafts outstanding	7,553,162	3,509,864
Investments	3,569,902	4,017,990
Net receivables (less reserves)	6,701,588	4,659,576
Inventories	19,754,648	21,514,248
Deferred charges	440,491	761,323
Current Liabilities:		
Accounts payable—current	6,194.527	6,756,635
Reserves for taxes	4,319,311	3,418,695
Reserves—Dealers' discount and deposits	1,247,384	1,923,450
Other payable reserves	1,721,136	3,389,817

Climax Engineering Co. Forms Part of Merger

CLINTON, Iowa, April 30—Stockholders of the Climax Engineering Co. have authorized its consolidation with the Clinton Refrigerationg Co. The new merger will be known as the Climax Refrigerating Co., with a $2,000,000 capital stock issue.

The plant of the Climax company will be enlarged to accommodate the combined forces and will be devoted to the manufacture of gasoline and oil engines and refrigerating machines. George W. Dulany, Jr., will be president; H. W. Seaman, vice-president, and G. Cravens, vice-president and general manager.

TIRE CREDIT MEN ORGANIZE

NEW YORK, May 1—Representatives of fifteen different tire manufacturers have formed the Association of Rubber Credit Men to protect the mutual interests of the manufacturer, tire dealer and public. The organization is largely local in character, being brought about by numerous recent bankruptcies in Greater New York.

FISHER MADE RECORD YEAR IN SHIPMENTS

DETROIT, May 1—The Fisher Body Corp. shipped 420,499 bodies in the fiscal year ending April 30, 1923, compared with 158,224 in 1922, 200,197 in 1921, 328,978 in 1920 and 134,767 in 1919. It is expected to jump this to 800,000 in the year just beginning. When the company completes its plant expansion, it will have a productive capacity of 1,200,000 bodies.

Of the 420,499 bodies produced in the last fiscal year 217,632 were closed, or only 15,235 more than open bodies. In the 1924 production there will be 550,000 closed jobs and 250,000 open. As showing the increasing popularity of the closed body, there were 103,449 open jobs and only 31,318 closed ones in 1919.

Atwater Kent to Build New $1,000,000 Factory

PHILADEPHIA, May 2—The Atwater Kent Manufacturing Co. will erect a new plant at a cost of $1,000,000 to be devoted to the manufacture of automobile and radio supplies. It will be located at Wissahickon and Abbotsford Avenues, where the company has purchased fifteen acres as a site. The company's present plant is at 4937 Stenton Avenue.

Increased demand for automobile and radio supplies, according to A. Atwater Kent, head of the concern, makes the expansion necessary. The work of erecting the first section of the building will be started at once, although the company will continue to occupy its present quarters for at least two years.

Kent states that the company now has 1200 employees on its payroll, and it is expected that 2000 will be employed upon the completion of the new plant.

Goodyear "Cross-Rib" Is Renamed "Wingfoot"

AKRON, May 1—The trade name of a new cord tire, recently introduced by the Goodyear Tire & Rubber Co., has been changed from the "Cross-rib" to the "Wingfoot." The symbol "Wingfoot" has been used by Goodyear for many years, principally on rubber heels, but never before on tires. The tire sells slightly under the standard cord tire price lists.

It is built on the group ply construction plan and has the same bead construction as the Goodyear All-weather tread cord tire.

Receivership Sought as Ansted Protection

Company Has Valuable Contracts, Creditors Say in Applying to Court

CONNERSVILLE, IND., April 30—Petition for a receivership has been filed here in Circuit Court against the Ansted Engineering Co. of Connersville by the Wyman-Gordon Co. of Worcester, Mass.; Vonnegut Hardware Co. of Indianapolis; Cincinnati Screw Co. of Loveland, Ohio, and the William D. Gibson Co. of Chicago.

The plaintiffs allege that the concern is indebted to them in amounts approximating $68,500, and that there is other indebtedness against the company of about $482,000. It is alleged that the debts are long past due, and that the concern is unable to meet its obligations.

It is said that the action is a friendly one and that a receiver is sought to conserve the assets of the company for the benefit of creditors and stockholders, and to facilitate a proposed reorganization plan through which it is hoped to continue operations of the company.

Now Working on Contracts

It is claimed that the company has been and is working on valuable contracts and that deliveries and profit from them will be placed in jeopardy, unless the company seeks the protection of court.

It is alleged that the directors of the concern recently resigned and that there is no formally constituted body to handle the administrative affairs of the concern. There are said to be assets of $2,200,000, with liabilities of approximately $1,500,000, of which $1,000,000 is represented by a serial note issue secured by a mortgage on the company property.

Receiver to Try to Keep Plant of Mitchell Intact

RACINE, WIS., April 30—Herbert F. Johnson, president of S. C. Johnson & Sons Co., who was appointed receiver of the Mitchell Motors Co., Inc., is proceeding to liquidate the assets as quickly as possible.

The plant, which suspended operation March 1, will not be placed in production, at least until disposition of the property has been made in the course of the receivership and new ownership becomes effective. Appraisals are being made and schedules prepared for filing under the involuntary bankruptcy proceedings.

It is stated that the liabilities approximate $4,000,000, and the tangible assets are worth $2,000,000. The effort at disposition to be made in due time will be to keep the industry intact and avoid piecemeal sales of buildings or equipment.

Old Lincoln Building Used in Body Making

Ford Assembling in Holden Avenue Plant for Two-door Sedan Exclusively

DETROIT, April 28—Ford Motor Co. has converted the former Holden Avenue plant of Lincoln Motor Co. into a plant for the exclusive assembly of two-door sedan bodies for Ford cars. The entire production demands for this type of body for car assembly plants within a fixed radius of Detroit will be met. Latest types of ovens, conveyors and working apparatus have been installed and particular attention has been paid to protect the building against fire.

During the time the Lincoln Motor Co. was an entity, the Holden Avenue plant was used for a large part of the machining operations. When taken over by Ford, the equipment was moved to the main plant and machining consolidated there. Since that time the building had not been utilized. There is approximately 83,000 ft. of floor space with a railroad switch to the Grand Trunk.

With the development of Ford business to the present point, and the heavy increase in closed car business, glass requirements of the company have risen to 20,500,000 sq. ft. annually. The company points out that this is more than a quarter of the 1922 glass production in the United States for all purposes.

Output of the Allegheny Plate Glass plant recently acquired is placed at 7,000,000 sq. ft. annually. The company is pushing construction of its River Rouge glass plant, but even with this completed the company still will buy a considerable part of its glass in the open market.

No changes in manufacturing at the Allegheny plant are contemplated for the present because most of the product formerly was taken up in the automotive industry.

New Cylinders Developed for Liberty Air Engines

PATERSON, N. J., May 2—Because of the fact that Liberty aircraft engines have been subject to failure of the steel cylinder jacket, resulting from rusting during storage and also from water leakage owing to the welds opening up in service, the Wright Aeronautical Corp. has developed a new cylinder construction for Liberty engines similar to that which has been successfully used on its Model E-4 and T-2 engines.

This general construction was illustrated in the July 13, 1922, issue of AUTOMOTIVE INDUSTRIES, in connection with the T-2 engines, and consists of cylinders in blocks of threes, with aluminum combustion chambers and both valves and spark plugs seating in aluminum bronze bushings shrunk into position.

These cylinders cannot be damaged by rust in storage, nor are they susceptible to water leaks, as the water is carried in the aluminum cylinder blocks. This new type of construction was employed in the recent 573 hour Navy endurance test of a Wright Model E-4 engine.

Besides overcoming jacket failure, the new construction considerably stiffens the engine. Moreover, the valve gear is completely inclosed, and there is, therefore, no oil leakage on the top of the engine. The power of the Liberty engine is said to be increased approximately 10 per cent, and it is claimed that it is possible to operate the engine six times as long as with the old cylinder construction, without a stop to overhaul.

TAX RECEIPTS GROW OVER MARCH, 1922

WASHINGTON, April 28—Tax returns submitted to the Commissioner of Internal Revenue place the receipts from the manufacturers' excise tax on automobiles, motorcycles, accessories, etc., for March at $12,173,534, an increase of $5,167,949 over March of last year.

The data show that the segregated taxes collected on automobiles, trucks and wagons in March, 1923, totaled $725,008, as against $486,871 for March, 1922.

As an indication of the increase in production in the automobile industry, the excise taxes on "other automobiles and motorcycles" amounted to $8,070,319, an increase of $4,225,784. The taxes paid on automobile accessories and parts amounted to $3,378,206, an increase of $704,028.

Taxes on passenger automobiles for hire amounted to $32,891, an increase of $9,173. The total amount of segregated excise taxes collected during March amounted to $13,669,994, showing that more than 90 per cent of this sum was collected from the automobile industry.

HENRY H. SKINNER DEAD

SPRINGFIELD, MASS., April 28—Henry H. Skinner, president of the Hendee Manufacturing Co., died of heart disease April 26 in Springfield, Mass., while on the way from his office to his home. He had long been active in banking and financial circles. He was sixty-five years old.

SOME ELGIN ASSETS SOLD

CHICAGO, April 30—Tangible assets of the Elgin Motor Car Corp., exclusive of building and real estate, were sold piecemeal at receiver's sale last week for approximately $75,000. The receiver is endeavoring to sell the buildings and real estate at private sale.

300,000 Ford Cars Wanted This Month

Company Heavily Oversold, with Plant Capacity Placed at About 160,000

DETROIT, May 1—Dealers orders for Ford cars to be delivered in May approximate 300,000 cars, the company reports, with a total production possibility of about 160,000. In view of present and anticipated conditions, the company expects to continue operations at capacity for the balance of the year, with an output for all of 1923 of well over a million and a half.

Sales in the first quarter of the year of 395,962 are reported the highest for any quarter in the company's history, and an increase of 135 per cent over the same quarter last year. In the last year, the company reports, approximately 1,500,000 new cars and trucks have been placed in owners' hands.

Purchase Plan Spurs Salesmen

Because of the oversold condition of the market, the company reports the weekly purchase plan as giving retail salesmen an additional incentive for working along at top speed. With deliveries tied up for the present, salesmen are being urged to give all their attention to signing up buyers on the weekly purchase plan. This will give them a steady flow of commissions as possession of cars is taken in the future. To the factory it means a regular run of business through the year, reducing the rush in the early spring months.

Factory officials declare this to be the most important part of the weekly purchase plan. Building up a large group of weekly payment buyers will mean within a short time a constant completion of purchase obligations. This process is likened to the continual turning of a wheel, each spoke as it completes its circle dropping off a large group of completed purchases. The field of buyers it is proposed to reach by this plan numbers 20,000,000, and this is in addition to the buying class which can purchase on the regular deferred payment plan. This latter field is far from exhausted, as present buying conditions indicate, officials say.

Full Payment Desired

Impressions that deliveries would be made to participants in the weekly purchase plan when they had saved an ordinary down payment as under the deferred payment plan is corrected by the factory to the extent that such deliveries would be made only in cases where the dealer considered the buyer well able to complete his payments on the regular deferred payment plan. For the most part the plan will require participants to save the complete purchase price.

Officials declare they expect it to be six or seven months before the plan can be considered to be well under way.

Axle-Spring Merger Aided by Stock Sale

Additional Working Capital Also Provided for New Eaton Axle & Spring Co.

CLEVELAND, May 2—The proceeds from the public offering of 140,000 shares of no par common stock in the new Eaton Axle & Spring Co. at $30 a share will be used to complete the merger of the Torbensen Axle Co., the Eaton Axle Co., the Perfection Spring Co., the Pontiac Spring Co. and service stations in Cleveland and New York, and to provide additional working capital. It is reported that the issue has been oversubscribed.

Personnel Announced

J. O. Eaton, president of the Torbensen Axle Co., will be president of the new company, while C. L. Ochs, general manager of the Eaton Axle Co., will be vice-president and general manager of the axle division. D. C. Swander, general manager of the Perfection Spring Co., will be vice-president and general manager of the springs division. R. C. Enos, general manager of the Torbensen Axle Co., will be vice-president and director of sales for the entire company. F. A. Buchda, secretary-treasurer of Torbensen, will become treasurer of the new company, and H. C. Steusy and H. D. Knorr, controllers of axle and springs divisions, respectively. P. T. Hill will assume charge of sales of the axle division. He is now with Eaton.

E. V. Elconin of Eaton will be chief engineer of the axle division, while G. W. Carlson, chief engineer of Torbensen, will be director of engineering. C. H. Hunt will be production manager and V. Cada purchasing agent for the axle division. G. C. Shontz has been named as metallurgist and R. W. Frey purchasing agent for the spring division.

Average Earnings $961,554

W. H. Wallace is sales manager of the springs division. M. W. Wimmer will be in charge of operations at the Perfection plant. B. A. Litchfield will continue to operate the Pontiac plant, and H. G. Weymouth and George Smith will be in charge of operations at the Eaton and Torbensen plants as works managers.

Average annual net earnings of the combined properties included in the merger, for the six years ended Dec. 31, 1922 (exclusive of Eaton Axle, whose first full year of operations was 1922), after giving effect to Federal taxes at 1922 rates, were $916,554, or $4.16 a share on the 220,000 shares of stock to be presently outstanding.

These figures are after depreciation and inventory adjustments, but without deducting interest which will be eliminated by this financing. Eaton Axle earnings for 1922 were $155,942 after Federal taxes, or 70 cents a share. Applying these earnings to the six-year period, average annual net earnings per share would be $4.86.

During the six-year period the properties are said to have shown a profit each year, including the time of extreme depression.

A dividend policy of $2.60 a share annually is warranted in the judgment of the company's directors and is expected to be initiated with the payment of a quarterly dividend of 65 cents a share on July 1, 1923. This will be at the rate of more than 8.65 per cent on the price at which the stock is being offered.

G. M. C. Reports 89,187 Employed During March

NEW YORK, May 2—General Motors, which has plants located in thirty-six cities of this country and Canada, had 89,187 employees during March, compared with 55,961 in March, 1922, and 44,439 in March, 1921. The record by months follows:

	1923	1922	1921
January	80,896	47,375	37,306
February	84,242	50,724	40,039
March	89,187	55,961	44,439
April	.....	61,292	48,459
May	.....	64,545	50,463
June	.....	69,024	48,689
July	.....	71,150	46,271
August	.....	72,199	50,521
September	.....	71,330	51,456
October	.....	69,856	49,125
November	.....	75,477	48,885
December	.....	75,214	35,931
Yearly Average	.....	65,345	45,965

These figures include the employees of Buick, Cadillac, Chevrolet, Oakland, Oldsmobile and GMC truck, together with other manufacturing and selling divisions and subsidiaries and all office employees, but do not include employees of Fisher Body or other affiliated companies.

Turner Files Voluntary Petition in Bankruptcy

MILWAUKEE, April 30—The Turner Manufacturing Co. of Port Washington, Wis., manufacturer of tractors, gas engines, etc., has filed a voluntary petition in bankruptcy, admitting liabilities of $236,550 and claiming assets of $363,687. Proceeding were instituted by W. J. Niederkorn, secretary.

Unsecured claims are listed as $206,008 and consist largely of notes signed by creditors and stockholders. One note is for $46,191 and is signed by the Independent Harvester Co., Milwaukee, and another for $10,199 is signed by the Grafton (Wis.) Foundry Co. Secured claims amount to $30,542, and the principal items are notes to the First Wisconsin National Bank of Milwaukee.

NORTHERN RUBBER STARTS

AKRON, May 2—The newly organized Northern Rubber Co. started production May 1 in the plant of the old Biltwell Tire Co. at Barberton, which it purchased recently for $200,000.

W. P. Herod Is Named Lexington Receiver

Company Makes General Denial of Charges Contained in Receivership Suit

INDIANAPOLIS, April 28—Federal Judge A. B. Anderson this afternoon appointed William Pirtle Herod, an Indianapolis attorney, receiver for the Lexington Motor Co. of Connersville, fixing bond at $25,000.

Earlier in the day the Lexington company had filed a general denial to the charges made in the receivership suit brought by the Jacques Manufacturing Co. of Wilmington, Del.

Asks Discount Receivership

INDIANAPOLIS, May 1—Superior Judge Sidney Miller yesterday appointed Harry Lyons receiver for the Lexington Motor Sales Corp. of this city, a subsidiary of the Lexington Motor Co. of Connersville, which went into the hands of a receiver last week. Lyons has been manager of the sales concern.

The receiver was appointed on petition of the Continental Discount Corp. of Connersville, which alleged that the sales concern has obligations outstanding to the amount of $200,000, and that it owed the plaintiff $551, which it admitted it could not pay.

Another receiver suit filed in Connersville charges that the Continental Discount Corp. is insolvent. The complaint was brought by James A. Murphy of Connersville, formerly connected with the Connersville Foundry Co. The complaint asks judgment on a note of $1,300, due April 9.

It is said that various creditors and stockholders of the Discount Corp. approve the proceedings for a receiver. Officers of the Lexington Motor Co. are connected with the Continental Discount, but the organization is said to be separate from the United States Automotive Corp. of which the Lexington is a subsidiary. The date for the hearing has not been set.

Government Files Tax Liens

INDIANAPOLIS, April 29—M. Bert Thurman, collector of internal revenue, has filed tax liens with the clerk of the Federal Court here against the Lexington Motor Co. of Connersville.

The liens are to secure payment for the manufacturer's excise tax for November and December, 1922, amounting to $31,682, together with a penalty of $834, and the excise tax of $7,196 for January, 1923, with a penalty amounting to $354.

PIERCE SERVICE MEETING

BUFFALO, N. Y., May 2—The Pierce-Arrow Motor Car Co. will hold a service conference at the factory on May 21 and 22. Service managers and representatives from dealer and distributor organizations will attend.

Truck Demand Shows Steady Move Onward

Production Each Month Since First of Year Has Shown Marked Improvement

NEW YORK, April 30—The first two weeks of April showed an increase in the production of automobiles and motor trucks of 3 per cent over a similar period in March, due principally to a higher schedule of operations adopted by the smaller producers. The major manufacturers continue to follow the level of March programs which established heretofore unequalled production marks. Little variation from the pace set at the beginning has been manifested during the month.

Shortage of Cars Reported

A shortage of the popular makes of cars is reported in many distributing centers, notwithstanding some improvement in the rail situation, the inauguration of boat service for shipments and a greater number of driveaways by dealers. The demand for cars has been so heavy that it has piled up orders with the major manufacturers and, in many cases, made immediate delivery impossible.

Parts making facilities are being taxed to make deliveries for truck builders and to keep up with the demand emanating from car producing areas. In the truck branch of the industry there are renewed signs of reawakening of interest with the consequent stepping up of operating schedules.

The output of trucks has showed a steady gain since the first of the year. In January, 19,377 of these vehicles were produced; in February, 21,815 and in March, 34,593. These figures are far ahead of those for the same months of 1922 and those for January are more than double the total for the same period in the previous year. For the first quarter of 1923 production aggregated 75,785, as against 42,372 for the first three months of last year.

Truck Output Absorbed

This output has been readily absorbed. Agricultural districts are again in the market for motor vehicles and a steady demand is reported from commercial centers. Highway improvements, more extensive building operations and increased operations in lines of similar activity are proving an impetus to truck sales. Farm sections are carrying out the early predictions that truck interest would take a long swing in their direction during the spring.

The present demand and the outlook for motor buses are other encouraging features entering into augmented schedules at truck plants. A larger field has been developing for this type of vehicle and new outlets are being opened. Throughout the Southeast, in particular, new strong interest is reported, based on the improved road conditions existing in that section and the steady advance being made toward a more extensive highway system.

Indications are apparent that tire makers have built up a surplus and are lowering their production schedules gradually. The companies have been operating on programs that, in instances, mounted to the peak marks of 1920. This has enabled them to obtain a reserve supply to take care of immediate demand.

M. A. M. A. MEMBERS REPORT GAIN IN MARCH BUSINESS OF 22.49 PER CENT

NEW YORK, April 30—Reports from members of the Motor and Accessory Manufacturers Association show that sales in March increased 22.49 per cent over the preceding month, the total purchases amounting to $59,428,800.

The following table shows the sales by members of the association, the total past due accounts and the totals of notes held for all of 1922 and the first three months of 1923:

1922	Total Sales	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
January	$17,320,000	20.61 Inc.	$4,450,000	5.45 Inc.	$3,146,000	7.02 Dec.
February	22,720,000	31.17 Inc.	4,070,000	8.57 Dec.	3,483,000	10.74 Inc.
March	28,670,000	26.14 Inc.	2,890,000	28.86 Dec.	2,657,000	23.69 Dec.
April	33,830,000	18.70 Inc.	3,000,000	2.00 Inc.	2,500,000	1.05 Dec.
May	43,700,000	28.06 Inc.	2,900,000	2.75 Dec.	2,450,000	6.05 Dec.
June	42,000,000	3.85 Dec.	2,840,000	1.25 Dec.	2,320,000	5.00 Dec.
July	41,001,670	2.42 Dec.	3,423,850	20.42 Inc.	2,217,670	4.49 Dec.
August	43,700,000	5.00 Inc.	3,705,000	8.21 Inc.	2,398,350	8.15 Inc.
September	37,300,050	13.36 Dec.	4,220,400	13.91 Inc.	2,658,800	10.86 Inc.
October	39,753,800	3.90 Inc.	3,463,850	17.93 Dec.	2,603,100	2.09 Dec.
November	36,616,850	5.51 Dec.	4,245,850	22.58 Inc.	2,442,700	6.15 Dec.
December	34,711,630	5.20 Dec.	3,494,850	17.69 Dec.	1,905,650	21.98 Dec.
1923						
January	$45,451,950	30.94 Inc.	$2,469,950	29,33 Dec.	$1,945,850	2.11 Inc.
February	48,518,700	6.75 Inc.	2,741,100	10.82 Inc.	1,981,950	1.86 Inc.
March	59,428,800	22.49 Inc.	2,129,350	22.32 Dec.	1,929,300	2.66 Dec.

BUYS SITE FOR WASHINGTON

MIDDLETOWN, OHIO, April 30—The Washington Motor Co., which is now located at Eaton, Ohio, has purchased a site here for the erection of a modern plant for the manufacture of Washington cars. The officers of the company, all of Eaton, are: A. H. Chrisman, president; E. C. Wysong, vice-president; J. E. Vogue, secretary, and O. M. Shipley, treasurer.

MOLINE BODY AT CAPACITY

MOLINE, ILL., April 30—The Moline Body Corp., maker of automobile bodies, has extended its plant to full capacity production with 500 employees on a 55-hour week schedule.

Sales of Parts Gain; Collections Improve

NEW YORK, April 30—Indicative of the speed at which the automotive industry is traveling is the report of members of the Motor and Accessory Manufacturers Association on March business.

Sales during the month totaled $59,428,800, an increase of 22.49 per cent over February, when the aggregate was $48,518,700, and an increase of 110 per cent over March, 1922, the sales then amounting to only $28,670,000. In the matter of collections past due accounts amounted to $2,129,350, a decrease of 22.32 per cent over February's $2,741,100, with March, 1922, showing $2,890,000. Notes outstanding decreased 2.66 per cent, dropping from $1,981,950 in February to $1,929,300. March, 1922, showed $2,657,000 in notes outstanding.

All indications point to caution on the part of the parts makers as well as the automobile manufacturers. Both branches of the industry are exercising conservatism in buying and manufacturing. Orders now on the books are for supplies for only sixty days. Few of the parts plants have orders farther ahead than July, although there are a few who have bought as far in advance as September.

WILLIAM D. GRIDLEY DIES

DETROIT, April 28—William D. Gridley, auditor and assistant treasurer of the C. R. Wilson Body Co., died at his home here from pneumonia. He was born in Detroit, Nov. 27, 1867, and had been in business here all his life. He was city accountant for two years under the administration of Mayor George P. Codd, and for the last twelve years has been connected with the Wilson company.

New System Followed to Meet Tire Claims

Dealer Makes Report on User's Complaint and Factory Takes Final Action

NEW YORK, May 2—The Tire Executive Committee of the Rubber Association of America has approved the plan submitted by the Service Managers Committee for a new system of adjusting claims with owners by dealers who do not have the adjustment privilege. Some of the companies already have put this plan into force and so well is it working that it is predicted that eventually it will eliminate most of the claims which now are made for adjustments.

The association has evolved a form "Report on Claims," one for the dealer and the other for the owner. When the owner goes to the dealer for an adjustment and the dealer is not authorized to make the adjustment himself, the latter gathers the facts as to the service the tire has given and forwards it to the factory. In turn the factory examines the tire and decides whether or not the claim is just, following which the blank indorsed by the committee will be used.

Makers' Position Stated

This blank states positively what the manufacturer will do in the case. If it has been decided that the claim is just the factory states that a replacement will be made for so much money, not including transportation charges. Attached to this is another blank for the owner to sign after he has been advised of the factory action. On this he checks off whether or not the new tire is to be sent by freight or express and whether the old tire shall be scrapped or returned by express, charges collect.

The principal purposes of the "Report on Claims" are: first, to insure so far as possible, fair treatment of the consumer; second, to impress him with the fact that it is the manufacturer who is making the adjustment for him; and third, to indicate that the transaction is being handled in a business-like way, strictly upon the merits of the consumer's claim in relation to the provisions of the Standard Tire Warranty.

G. M. C. Estimates April Production at 73,100

NEW YORK, May 1—Preliminary figtures as announced by the General Motors Corp., show April production of its several car manufacturing units to have been 73,100, as compared with 40,474 in April, 1922.

Revised figures on March production have increased the output from 68,900, as first announced, to 71,698, as compared with 34,082 in March, 1922. This brings the quarter's production up to 176,420, as compared with 71,039 in the first quarter last year.

40,930,852 *CASINGS PRODUCED LAST YEAR*

NEW YORK, April 30—Production of tire casings in 1922 totaled 40,930,852 in comparison with 26,000,000 in 1921, according to statistics compiled by the Rubber Association of America. Added to this, there were 874,003 solid tires manufactured and 50,849,912 inner tubes. In producing these casings, tubes and solids, it required the consumption of 523,526,219 lb. of crude rubber and 178,049,206 lb. of fabrics.

In arriving at these totals, General Manager A. L. Viles actually received reports on 75 per cent of the whole on casings and tubes and 90 per cent on solids. With tire casings, the production reported to the association was 30,698,139 and the estimate placed at 40,930,852; with tubes, 38,137,435 and a total of 50,849.912 arrived at and with solids 786,603, the estimated total being 874,003.

$1,275 Sport Phaeton Now Part of Earl Line

DETROIT, May 1—Earl Motors Manufacturing Co. has added a new sport phaeton on standard chassis to its line, priced at $1,275 at Jackson.

The color is in ultramarine blue with trimmings and upholstery in black leather. Headlights and cowl side lights are barrel type, nickel plated. Extra equipment consists of nickeled radiator, traveling trunk on rear, nickel plated front and rear bumpers, stop light, motor light under hood, spare cord tire and tube and safetey gasoline shut-off valve.

Racine Radiator Takes Plant of Former Perfex

RACINE, WIS., April 30—Within a few days after the assets of the defunct Perfex Radiator Co. of Racine, Wis., were sold at receiver's auction, a new corporation composed of Milwaukee and Racine capitalists took charge. It is styled the Racine Radiator Co.

The plant, which has been operated under the receivership is now running at capacity with a force of 150 men, and has guaranteed orders on the books valued at nearly $100,000, for passenger car, truck and tractor radiators.

The Perfex company, a $1,000,000 corporation, had been in more or less litigation for several years due to internal dissension. Since receivership proceedings were instituted six months ago, the plant has been managed by Fred M. Young, formerly of Milwaukee, working under the direction of Willis E. Keats, receiver, Milwaukee. Daniel G. McLeod and Merritt M. Alexander of Milwaukee, with Young, are the principals in the new corporation.

"Facts and Figures" Ready for Issuing

Completed Compilation Puts Total Production in 1922 at 2,659,064

NEW YORK, April 30—"Facts and Figures," issued annually by the National Automobile Chamber of Commerce, giving statistics of the progress of the industry for 1922, is ready for distribution.

As compiled by John C. Long, it shows that 1922 was a record year, with 2,406,396 passenger cars and 252,668 trucks, a grand total of 2,659,064 manufactured. This was an increase of 60 per cent over 1921. The total includes vehicles made in Canada in plants controlled by United States companies. The net production figure for motor vehicles made in the United States is 2,561,000.

$1,456,649,954 Invested

The N. A. C. C. estimates that there is $1,456,649,954 capital invested in the motor vehicle manufacturing business; that the various manufacturers bought $1,289,614,326 worth of materials; employed 253,105 persons and paid $395,707,531 in wages and salaries. The wholesale value of the complete car and truck output was $1,789,638,365; the value of parts and accessories replacements, $380,503,024, and the value of tire replacements, $388,066,000.

Fuel figures show that 6,202,234,613 gal. of gasoline were produced in the United States and 5,382,504,177 consumed, of which 80 per cent was used by motor vehicles.

Analyzing the truck production, Long finds that of the total of 252,668 manufactured, 62,194 were ¾ ton or less; 147,796, 1-ton; 7134, 2-ton; 13,830, 1½-ton; 13,830, 2-ton; 11,247, 2½-ton; 3319, 3½-ton; 5718, 5-ton, and 1430 over 5-ton. In 1921, 147,550 trucks were manufactured.

The chamber reports the registration of 12,239,114 motor vehicles in 1922 as against 10,464,005 in 1921.

Industry Sixth in Exports

In the matter of exports the total value of United States automotive exports was $125,642,852, including motor vehicles, parts, engines and tires, giving a ranking of sixth among all United States exports including raw materials. United States motor vehicles exported numbered 78,549, of which 67,096 were cars and 11,453 trucks. Motor vehicles shipped to United States territories totaled 3395 and Canadian motor vehicles exported, the output of branches of United States companies, were 37,958. The leading motor car foreign market was Australia, while Belgium was the best truck customer. The imports of motor vehicles totaled 456.

It is estimated that there are 3,500,000 motor vehicles on the farms, of which 300,000 are trucks.

Men of the Industry and What They Are Doing

Slack Chief Engineer for Peerless

F. W. Slack has been appointed chief engineer of the Peerless Motor Co., succeeding Benjamin Anibal, resigned. Slack has been with the Peerless company fourteen years and is largely responsible for the Peerless eight-cylinder engine design. He has been acting as assistant chief and chassis engineer. He was employed in 1903 by Packard.

Prior to his connection with Peerless, Anibal was chief engineer of the Cadillac Motor Car Co. and for 12 years served with General Motors, starting in the engineering department of the Olds Motor Works. Joining the Cadillac in 1911, he advanced from designer to assistant chief engineer and then chief engineer, assisting in the development of electric lighting and starting and the introduction of the V-type eight-cylinder engine. During the war he served as an assistant chief engineer of the Aircraft Division on Liberty engines for the General Motors Corp.

American Bosch Elects Metcalf

Morris Metcalf has been elected treasurer of the American Bosch Magneto Corp., succeeding George A. MacDonald, whose duties as president of the Chicopee National Bank of Springfield, Mass., make it impossible for him to give sufficient time to the Bosch company. He will retain, however, the office of vice-president. Prior to joining American Bosch, Metcalf was identified with the Guaranty Trust Co. of New York, for which he went to South America on a financial mission last year.

Garford Officials Advanced

Changes made in the personnel of the Garford Motor Truck Co. have resulted in the promotion of J. F. Bowman from general sales manager to vice-president in charge of sales; the advancement of Wilbur W. Smith from assistant sales manager to sales manager, and the naming of D. B. McPheron, former superintendent, as factory manager.

Peek Awarded D. S. M.

George N. Peek, president of the Moline Plow Co., is one of ten members of the war industries board awarded the Distinguished Service Medal for service during the World War. He served from 1917 to the end of the war and was commissioner of finished products during that period. Some time ago Peek received the appointment of commander of the Order of the Cross of Belgium, conferred by King Albert.

Elected by Michigan Association

Three automobile executives were chosen officers of the Michigan Manufacturers Association at the annual meeting here this week, H. J. Mailory, vice-president of the Buick Motor Car Co., being elected first vice-president; Arthur T. Waterfall, vice-president of Dodge Brothers, vice-president, and M. L. Pulcher, vice-president and general manager of the Federal Motor Truck Co., a director for three years.

T. E. Coleman Returns Home

T. E. Coleman, vice-president and general manager of the Madison-Kipp Co., Madison, Wis., manufacturing automatic lubricating devices, has returned home from an extended tour of investigation and business in Canada and the British Isles. Coleman described trade in England as rather slow, with no immediate prospects of brightening up, while Canada is in a steadily improving position, although not as active as the United States.

Webb Given Additional Duties

Earle W. Webb, general attorney in charge of the legal department of General Motors at Detroit, has been given the added duties of head of the real estate department of the advisory staff, succeeding the late Charles McNamee.

D. Minard Shaw Resigns

D. Minard Shaw has resigned as assistant sales manager and advertising manager of Earl Motors Manufacturing Co., and has not announced any new connection for the present.

C. G. Spring Appoints Jennings

Joseph Jennings has joined the C. G. Spring Co. as financial executive. Since 1916 Jennings has been with E. E. Macrone Co., brokers. Previous to that he served as sales engineer for the New Departure Manufacturing Co. and has a wide acquaintance with the trade and financing.

Mench Joins Graham

Eugene L. Mench, Jr., has severed his connection with Service Motors, Inc., of Wabash, Ind., to join Graham Bros. of Evansville, Ind., as designing engineer. Previous to his Service connection, Mench was engineer for the Mutual Truck Co. of Sullivan, Ind.

Dahlquist Rejoins Timken Axle

Charles S. Dahlquist has returned to his former connection with the Timken-Detroit Axle Co. and will cover the Central territory, including Michigan, Ohio, western Pennsylvania, Canada and part of New York State.

Neill Visits Southern Branches

H. A. Neill, supervisor of branches for the General Motors Truck Co., is on a trip to the branches of the company at Atlanta, Memphis and St. Louis.

Stickney With LeBaron

Roland L. Stickney, formerly with the Locomobile Co. of America and Locke & Co., has joined LeBaron, Inc., New York custom body designer, and is engaged in the making up of designs in color and other art work. Jules A. Olivier, formerly of Rolls-Royce of America, Brewster & Co. and Locomobile, joins the staff May 15 to handle retail sales. Thomas L. Hibbard, president of the LeBaron company, is abroad, studying foreign design in coachwork construction. Raymond H. Dietrich is in charge of engineering operations during his absence.

Waltzer Joins Petroleum Firm

Edward J. Waltzer, who directed the reorganization of the Wetmore Reamer Co., Milwaukee, a year ago, and served as president and general manager since that time, has retired and is now associated with the Topp Oil & Supply Co., Milwaukee, distributor of petroleum products.

Richard B. Tracy Resigns

Richard B. Tracy has resigned as sales manager of the Paul Rubber Co. of Salisbury, N. C. Previous to that connection, Tracy had charge of sales for the Globe Rubber Co. of Trenton, N. J., and before that served as factory representative of the Michelin Tire Co. for many years.

Bowser Makes Appointments

R. R. Safford has been appointed manager of the S. F. Bowser & Co. of Texas, with offices in Dallas, succeeding L. P. Murray. R. G. Conklin has been appointed manager of the Minneapolis branch, succeeding Safford. I. D. Bone will be assistant to Conklin.

Mullins Body May Build Factory in Cleveland

CLEVELAND, May 2—C. C. Gibson, vice-president and secretary of the Mullins Body Corp. of Salem, Ohio, says that the company may build an assembly plant in Cleveland.

On account of the rush of orders it is becoming necessary for the company to consider erecting a branch factory in some city where there is a large labor supply. The plant at Salem is employing 1300 men, of whom 250 are living in a hastily built commissary. Another commissary is to be constructed for 250 additional men, who will be taken to Salem from Cleveland, Pittsburgh, New York and other cities.

A branch plant would be designed for finishing processes on stamped steel automobile body parts.

Orders on the books of the company will keep operations on high schedules until October.

91 Per Cent Increase in Wages Since 1914

Pay Was $15.09 Weekly Nine Years Ago—Higher Percentage on Per Hour Basis

NEW YORK, April 30—Wage earners in the automobile industry are being paid hourly 102 per cent more now than they were in July, 1914, their average earnings per hour as of last December being 59.2 cents as compared with 29.3 cents in July, 1914.

These figures have been compiled by the National Industrial Conference Board's studies of wages in the United States which are now being completed and which will be published at an early date. Advance data, however, show that in the agricultural implement industry the increase has been 88 per cent and in Northern cotton manufacturing 130 per cent.

This information is contained in a statement issued to its members by the National Automobile Chamber of Commerce, which also states: "The average weekly earnings of all wage earners in automobile manufacturing advanced in the same period from $15.09 to $28.85, or 91 per cent. In the agricultural implement industry the increase was from $13.78 to $24.56, or 78 per cent, and in Northern cotton manufacturing the increase was from $9.16 to $19.60, or 114 per cent."

The average hourly earnings December, 1922, were:

Male skilled labor in manufacturing automobiles	$0.623
Agricultural implements	.538
Cotton	.466
Male unskilled labor in manufacturing automobiles	.469
Agricultural implements	.407
Cotton	.377
Female labor in manufacturing automobiles	.407
Agricultural implements	.338
Cotton	.356

Three N. A. C. C. Members to Address U. S. Chamber

NEW YORK, April 30—A. J. Brosseau, Roy D. Chapin and A. H. Swayne will represent the National Automobile Chamber of Commerce at the eleventh annual meeting of the Chamber of Commerce of the United States to be held in New York, May 7 to 10. Transportation will be the keynote of the meeting.

Chapin and Swayne will address the delegates at the Waldorf-Astoria on May 9, while Brosseau, who is the N. A. C. C. director in the United States Chamber, will serve as chairman of the Fabricated Production Group meeting on May 8. Chapin will speak at the general session Wednesday morning on the general topic, "Developing a National System of Rail, Water and Highway Transportation."

Swayne, chairman of the United States Chamber committee on Relations of Highways and Motor Transport to Other Transportation Agencies, will present a progress report on the committee's work to the Transportation and Communication Group meeting, which will be held at the Roof Garden, Wednesday afternoon.

"Store Door Deliveries of Freight" is the subject assigned to W. J. L. Banham, traffic manager of the Otis Elevator Co., before the Domestic Distribution Group meeting, which will be held in the Astor Gallery Tuesday afternoon.

Builder of Checker Cab Purchases Handley Plant

(*Continued from page* 994)

space. When J. Dallas Dort purchased the plant from the Lull company, he completely renovated and re-equipped it with the most approved body-making machinery, also adding a complete system of lumber dry kilns. Purchase price and improvements aggregated a total outlay for the Dort company of approximately $670,000.

It has been known for at least two years that the Dort body plant was for sale, but there had been no opportunity to move it advantageously. The present deal will permit the Dort company to concentrate all its efforts in Flint, probably to the extent of selling its old plant there and of centralizing operations under one roof. This move, according to reports, would result in a reduction of the Dort bonded indebtedness to the extent of $800,000.

Checker Cab will continue operations in its present plant in Chicago until the Kalamazoo plants can be made ready for production.

Dort Plans Made

DETROIT, May 2—Dort Motor Car Co. will continue construction of its bodies at Kalamazoo for the present and is arranging for the manufacture in part of its body requirements at the Flint plant when the Kalamazoo plant is turned over to the Checker Cab Manufacturing Co. The future body policy of the company, it is declared, will provide for continued manufacture in part and for the purchase of the remainder of its requirements.

Date for Sale of Wills Factory Set for June 6

DETROIT, May 2—C. H. Wills & Co.'s plant will be sold by the receiver, the Security Trust Co., on June 6, the date of sale being approved today in the Federal Court. No upset price on the property was fixed.

Two hundred thousand dollars deposit must be filed by expectant bidders in Federal Court, Detroit, twenty-four hours previous to the date of sale. The sale will be held at Marysville at 1 o'clock, eastern time.

Overhead Keeps Ford Canadian Lists High

Prices of Cars Made in United States Lower Because of Greater Output

OTTAWA, ONT., April 30—Appearing before a special parliamentary committee on agriculture, Wallace R. Campbell, vice-president and treasurer of the Ford Motor Co. of Canada, explained to the investigators why prices of Ford cars are higher in Canada than in the United States.

While this subject was of importance to Canadians, to those in the automobile industry in the United States the cost of production as given out by Campbell was far more interesting. In explaining costs, Campbell divided them into two divisions—plant and overhead. Plant cost, he said, included labor and material. In January it was $292 in Canada on the phaeton, as against $234 in the United States.

The overhead costs in the American factory in December with a production of 124,795 cars was $43 per car, Campbell said. In the Canadian factory for the same month it was $204 per car for a production of 3137 cars. January with 109,000 production in the United States showed $44 overhead, while in Canada, with 6567, it was $98, thus demonstrating how volume production brings down overhead cost.

Production Costs Varied

Total costs of Canadian Fords in February were $394, the selling price then being $530. The total cost in December was $499 and in January $418. The price of the same car in the States at the same time was $393. The increase in manufacturing cost in Canada over the United States figure in December was $221, labor and material only. The excess of overhead was $43.

Pointing out that Canadians benefited by having a Ford factory in the Dominion, Campbell stated that, whereas a Canadian Ford sold for $579.28, an American Ford sold in Canada cost $612.45, including duties and taxes.

In Campbell's opinion, Ford prices are higher in Canada because of the small population. As pointed out, the volume of production governs manufacturing costs. The more product a given piece of machinery turns out, the cheaper the product per piece. Twenty-five units per hour produced by a machine that has a capacity of eighty-five units per hour must necessarily cost more per unit, Campbell says.

A. A. A. TO MEET MAY 22

NEW YORK, May 1—The twenty-second annual meeting of the American Automobile Association will be held here at the Biltmore on Tuesday, May 22. Secretary of Agriculture Henry C. Wallace and Police Commissioner Richard Enright will address the delegates.

CITIES REPORT ON SALES SITUATION

San Francisco

SAN FRANCISCO, May 2—Prospects for retail automotive business in the San Francisco territory for the next three months look good, although April business is not expected to equal that of March, when all records were smashed. For this reason dealers are not stocking cars, except as orders are received.

Some sales resistance is being caused by the varied prices of used cars in this territory. Popular priced new cars are moving slowly, while higher priced cars are going more readily, and low priced cars are selling very well. Sales of light trucks are reported to be increasing rapidly with a question of sufficient supply, while heavy trucks are moving better than usual, with standard lines reporting an increased volume of business.

Trucks and used cars are going especially well in country because of good crop conditions. March seems the peak, and the curve will be downward from March for the next three months, though probably still above what has been normal business for past two years.

Minneapolis

MINNEAPOLIS, May 2—In the Ninth Federal Reserve district, which includes all territory handled by Twin City motor car distributors, the automobile business is steadily improving, and May is expected to be a big month.

If there is to be a slump at all, it is expected to come between June 1 and July 15, everything depending on the crop prospects. The seeding season is late and the crop possibilities are still a guess.

The banking situating is better in that reputable dealers are able to finance themselves through the banks or credit firms organized by factory companies. Trainload shipments are common. The closed car ratio is steadily creeping up on the open car demand.

North Dakota west of the Missouri is improving, also Montana.

Louisville

LOUISVILLE, KY., May 2—Automobile sales have increased here during the last few months, 2027 cars having been sold in the first quarter of this year.

There seems to be no let up in the demand, and some of the distributors of old established makes are unable to secure enough models from their factories. As a result, a majority of the dealers have no opportunity to stock cars. The used car problem is worrying most dealers more than ever, since the bulk of the sales are to owners who have old cars to trade in.

Sales during the quarter, based on the price of the phaeton, were as follows: High priced, $2,500 and up, twenty-nine cars; medium, $1,000 to $2,500, 443 cars; low, less than $1,000, 1555 cars.

Of the high priced cars, nineteen were closed models and ten were open; of the medium, 248 were open and 195 were closed; of the low priced cars, 861 were open and 694 closed.

Los Angeles

LOS ANGELES, May 2—Dealers here representing popular makes of automobiles are exerting every effort to obtain increased shipments from the factories. The closing week of April showed an appreciable slackening in deliveries, and dealers maintain that this is due to their inability to get cars more than to a falling off in demand.

The demand for closed cars holds up remarkably well, but there never has been a time when sport models were so popular. The only dealers with any considerable stock of cars on hand are those representing lines that normally do not move rapidly. In southern California new cars are being registered at the rate of about 600 daily.

The demand for trucks, especially those of heavy capacity, is proving surprisingly large.

Detroit

DETROIT, May 2—The outlook for new car business in May is regarded by Detroit dealers as very promising. Sales probably will fall off somewhat from the record business of March and April. Although too early to judge of June business, it is expected that this will probably show a still further slackening, but still continuing good.

Except in the less popular makes of cars, there is no stocking, and by less popular is meant, in a Detroit sense, those made outside the city. The city-made cars, except in one or two instances, are sold well ahead, and deliveries on most models involve a wait of from ten days to two weeks.

The used car business continues to run along at about the same rate as new car business, which means, however, that dealers are not reducing their stocks perceptibly.

Boston

BOSTON, May 2—Motor car dealers in Boston expect that April will break all records for the sale of cars in this territory. Shipments are coming through in better shape than for some months, due to more seasonable weather and the greater use being made by railroads of open flat cars for making deliveries from factories.

Used cars have not been moving fast, a situation that is causing dealers some concern.

Denver

DENVER, May 2—The general trend of reports shows April ahead of March, with expectations for heavy sales during May and beyond. This favorable condition also holds true in the main throughout the Rocky Mountain territory.

Some dealers in outside districts are ordering cars now and having them held in the distributors' warehouses until the main-range mountain passes open up and the roads are ready for travel in the higher altitudes. One Denver dealer bought 100 cars last December, had them stored in Detroit, and then shipped them on flat cars, with gondola coverings, in order to take care of spring sales.

"Oversold in practically all models" is a frequent report, and the largest number of cars found stocked by any Denver dealer is thirty-five. Many are trying to stock cars ahead, expecting an early price increase, but shipments from the factories are not coming in fast enough. An encouraging outlook for several months represents the opinion of many of the leading dealers and distributors.

Birmingham

BIRMINGHAM, ALA., May 2—Retail sales in the section surrounding Birmingham and in the larger part of Alabama, Mississippi and the Memphis and Chattanooga territories of Tennessee are being limited by the inability of the dealers to supply cars in the more popular priced makes.

The demand continues excellent, and many records were made during March and April in sales.

Prospects for continued demand seem excellent, with general conditions showing continued improvement, and the only bad note to date being the slackening in the demand for lumber during the past thirty days.

On the whole, the dealers are decidedly optimistic over the outlook and expect continued excellent sales throughout May and June.

St. Louis

ST. LOUIS, May 2—The automobile business in the St. Louis territory is good. The chief factor that makes it good is the fact that the country dealers are really working and are really selling cars. They are coming in and driving them home, and in most cases have an order for the car they take back. Even those distributors who are inclined to be slightly pessimistic over the outlook will frankly admit that their wholesale business is exceptional.

Deliveries are gradually improving with the demand constantly turning to the closed car.

(Conditions in other cities on next page)

No Runaway Market Expected This Year

N. A. C. C. Directors at Detroit Meeting Feel Industry as Whole Is Watchful

DETROIT, May 2—Reports on retail sales conditions in twenty sections of the United States read at the May meeting of directors of the National Automobile Chamber of Commerce, which was held in Detroit instead of New York, indicated a continuance of the present strong spring business for at least two months longer. Demand was shown steady except in one or two sections, and the used car situation was described as spotty but predominatingly good.

Feeling at the meeting indicated that a slowing down in buying may be expected to occur in July and that considerable caution should govern manufacturers in laying out production schedules beyond this point. Evidences of softening in the non-ferrous metal markets were taken as indication that industry as a whole is buying carefully and that long time commitments are being avoided.

Because of the watchfulness of industry generally, the feeling of the meeting was that there will be no undue inflation in commodity prices and that the possibilities of a runaway market as in 1920 are negative.

Sales Conditions

Baltimore

BALTIMORE, May 2—An excellent volume of sales marked the first quarter of 1923 with most of the local dealers. Many of them declare that they did the best business in their history, not even excepting the peak year in industry when large salaries were being paid.

The improvement covers all classes of cars. Dealers are making aggressive efforts to keep business at a high mark.

Pittsburgh

PITTSBURGH, May 2—Delay in deliveries is reducing sales of the popular makes of cars in the Pittsburgh territory, but the total orders booked for spring delivery is believed to eclipse all former seasons.

Actual orders taken at the present time are somewhat less than two weeks ago, but many of these inquiries are from owners of cars who, it is believed, will hold up purchases until delivery is more loose.

Atlanta

ATLANTA, May 2—Retail automotive sales in Atlanta and the southeastern territory have as yet experienced no decline to speak of, and as a whole business appears to be holding up very well.

The outlook still is as favorable as ever, for cotton and other southern agricultural products are holding around good prices and the indications portend a highly successful farming year for the district. There has been a noticeable increase in car and truck sales in the rural communities this spring, and there seems to be no prospect of this business abating as long as cotton prices hold up.

Toledo

TOLEDO, OHIO, April 30—Sales of new cars in Toledo have not shown the usual tendency to speed up during the last few weeks but have held fairly steady. Weather conditions have been against the usual spring rush.

May will probably be the big month for sales, with the entire spring season drawn out over a period of months and better sales through the latter part of the summer. Used cars are almost a drug on the market with dealers attempting to find some way out.

Indianapolis

INDIANAPOLIS, May 2—Automobile sales for the Indianapolis territory in April will approach if not quite equal those of March, which was an abnormally good month for this city. In many cases dealers and distributors whose March business was the largest in history say that the early part of April was somewhat slower than expected, but that the last two weeks have brought really brisk business and the month will about equal the big record made in March.

Judging from present sales demand, most dealers expect as good May sales, provided that deliveries in some cases improve.

Philadelphia

PHILADELPHIA, May 2—Conditions in the automotive trades throughout Pennsylvania are remarkably good, with the outlook bright.

Retail automobile dealers are now stocking cars, this being due to the ability of dealers to get deliveries from the factories. Heretofore cars, though ordered, were badly delayed owing to troublesome railroad conditions.

Des Moines

DES MOINES, IOWA, May 2—There is every evidence of a continuation of good business in the Des Moines territory. In fact, conservative distributors here say they can see little possible chance for a let down in retail business within the next thirty to sixty days at least.

HARROUN SALE ON MAY 8

DETROIT, May 2—Creditors of Harroun Motors Corp. have received notice that the plant and property will be sold at bankrupt sale May 8. A meeting of the creditors will be held May 9 at the office of the referee in bankruptcy, Detroit.

Stockholders Agree on Northway Plans

Company's Debt Would Be Liquidated and New Working Funds Provided

NATICK, MASS., May 1—The Northway Motors will pass into the control of John M. Mack of the Mack Motor Truck Co. of Pennsylvania if the option voted by the stockholders today to give him control is carried out within 60 days. This is a modification of the plan advanced a week ago.

The alternative plan of Ralph N. Northway, giving him power to direct the company, was rejected.

The new Mack plan offers capital to retire outstanding preferred stock with a par value of $1,750,000, to liquidate the company's debt of $150,000 and provide working funds. Of a new issue of 250,000 shares of common stock with a par value of $10 a share, Mack will retain 75,000 while the present stockholders will get 50,000. The rest will be offered for sale.

The new plan provides that the present shareholders get 7 per cent of the preferred and 3 per cent of the common, the latter being the voting stock.

May Output Promises to Make New Record

(*Continued from page* 994)

mately 300,000 cars. Chevrolet is stepping up its schedule from the 1500 a day mark as rapidly as plant additions and equipment can be made ready. At Lansing, Star production is mounting from the 300 daily mark.

In the medium priced field Buick and Dodge Brothers are building from 700 to 800 daily, with Studebaker 600 to 700. Hudson-Essex is on a 400 daily schedule in May, Maxwell-Chalmers at 300 to 400, Hupp and Paige-Jewett at about 200, Olds, Oakland and Reo at about 150 and Rickenbacker, Earl, Dort and Durant four at 50 to 75.

Cadillac, in the high priced field, has increased its schedule to about 140 cars daily, and Packard is continuing at about 100 daily. Production by Wills Sainte Claire is nominal under the receivership.

Packard Export Trade Increases 100 Per Cent

DETROIT, May 1—The Packard Motors Export Corp. reports that business for the first quarter was at least 100 per cent better than 1922, with the latter year 200 per cent better than 1921. This, the company believes, is significant of returning prosperity in foreign countries.

Australia and Cuba continue to be the largest foreign markets for Packard.

10 Europeans Enter Indianapolis Race

Buggati, Rolland-Pilain, Mercedes and "Schmidt Special" Will Compete

PARIS, April 18 (By mail)—Ten Europeans will face the starter in the Indianapolis 500-mile race on May 30. The foreigners comprise a team of five eight-ahead Bugattis, with Count Zborowski, Pierre De Vizcaya, Prince de Cystria, Raoul Riganti and M. d'Alsaga as the drivers, Jules Goux on a "Schmidt Special" with an S. R. O. cuff valve engine; Albert Guyot on an eight-ahead poppet valve Rolland-Pilain, and the Mercedes team with Christian Lautenschlager, Christian Werner and Engineer Max Sailer as the drivers.

Members of Bugatti Team

The Bugatti team is made up entirely of private owners, all of whom are making their first appearance on the Indianapolis track. Count Zborowski, the last man to nominate with a Bugatti, is a wealthy Britisher who figured very prominently in races on Brooklands track. Vizcaya and Prince de Cystria are Frenchmen and Riganti and d'Alsaga hail from the Argentine. Major Galop, a Britisher, is coming with the team as reserve driver. The Bugatti party have made reservations aboard the Lafayette sailing from here April 28, and will be in Indianapolis for practice May 10.

Engineer Bechereau, the man responsible for the design of Spad airplanes, has produced the single-seater bodies for the Bugatti racers. The driver is carried centrally with only the upper portion of his face above the scuttle, and with the top of his head level with the line of the gasoline tank in the tail of the car. The Bugattis, which have straight eight engines, are running with hydraulic front wheel brakes.

In making its formal entry, the Daimler Motoren Gesellschaft of Stuttgart, Germany, announces that it will compete at Indianapolis with three cars which have four-cylinder engines of 122 cu. in. piston displacement. These probably will be the only four-cylinder engines in the race.

German Drivers Old Timers

The three drivers, Sailer, Lautenschlager and Werner, are old-timers in the racing game and have all been connected with Mercedes for a number of years. Lautenschlager, who doubtless will be the "Grandpa" of the race, for he is in his forty-seventh year, twice won the French Grand Prix road race, in 1908 and in 1914.

Max Sailer, 41 years of age, and an engineer by profession, has been connected with Mercedes since 1902. He is an exceptionally daring driver and was made use of in the 1914 French Grand Prix to run Georges Boillot to destruction, which task he successfully accomplished. Werner, 31 years of age, is a native of Stuttgart, and has been connected with Mercedes constantly since 1911, with the exception of the war period.

Little Known About Schmidt

INDIANAPOLIS, April 30—Considerable mystery surrounds the entry of Jules Goux of France in the 500-mile race scheduled for May 30 in that it is impossible to find out anything about the car he is to drive, a "Schmidt Special," designed by M. Schmidt, a famous European engineer. It is said the engine is operated without valves and has other startling innovations. Intimate details of construction can not be had because of patents pending.

Italian Chemist Urges Planting of Rubber Now

CHICOPEE FALLS, MASS., May 2—Prof. Giuseppi Bruni, head of the department of chemistry in the Royal Polytechnum of Italy, director of laboratories of the Pirelli Rubber Co. of Milan and special lecturer at Yale University, while inspecting the plant of the Fisk Rubber Co. here said that prompt and extensive planting operations must be undertaken to save the world from a rubber scarcity within the next ten years, due to the work of planting being largely in suspense during the years of the World War.

Nearly a year is required to prepare the land for trees, and at least five years for the trees to develop to the production stage. Synthetic production of rubber probably never will be an economic success, he said, owing to the high cost of chemical materials. He regards Sumatra and certain other of the Dutch islands as best suited to development of rubber plantations, because they afford the combination of proper natural conditions and low labor cost.

7500 Tractors Delivered in Texas Last 12 Months

DALLAS, TEX., May 2—More than 7500 tractors were sold and delivered in Texas during the past twelve months, according to figures compiled by dealers and distributors in Dallas. The majority of these were for farms of the Panhandle section, North Texas, Central Texas and the rice growing sections of southeast Texas. A number were sold for road work and still others to ranchers.

The tractor business for the first four months of 1923 has shown an increase over the same period of last year.

HESS PLANT TO BE SOLD

CLEVELAND, May 2—Receiver Frank A. Scott of the Standard Parts Co. will sell at auction the Hess Spring & Axle Plant at Cincinnati. Samuel N. Winternitz & Co., auctioneer of Chicago, will be in charge of the sale.

Durant Plants Reach Goal of 1,000 Daily

Production for April Aggregated 21,216, or 1,716 Above Total Schedule

NEW YORK, April 30—Striving to reach a production of 1000 cars a day, Durant Motors reached its goal on April 25, when 1135 Durant and Star cars were produced. On the next day the total was 1062 and for the month of April the production was 21,216, as compared with the scheduled 19,500.

Durant also is surprising the Canadians by shipping trainload lots, sending out a trainload from the Leaside plant on April 24 to the Beach Motor, Ltd., at Ottawa, there being 108 cars in the train. Another big shipment was three trainloads of 850 cars to the New England territory.

Rumors of a price advance was caused by an advertisement of the Syracuse dealer who talked mysteriously about a saving of from $25 to $100 if orders were placed before April 30. It is understood that Durant Motors is charging a premium to those dealers who have exceeded their allotment and desire more cars.

The parent company, in such cases where the schedule is upset, charges premiums to make up for the higher cost of materials and labor since the dealers placed their original orders. In turn these dealers are passing the extra charge along to their customers.

Auburn Increases List of Two of Its Models

AUBURN, IND., May 1—The Auburn Automobile Co. has increased the prices of its cars, effective today. The 6-63 model, known as the "Supreme Six," is from $75 to $100 higher than the old list, while the 6-43 models are increased $70. The new price schedule is as follows:

"SUPREME SIX" MODELS

	Old Price	New Price
5-passenger phaeton	$1,650	$1,725
Sport phaeton	1,895	1,985
Brougham	1,965	2,045
Sedan	2,245	2,345

6-43 MODELS

	Old Price	New Price
5-passenger phaeton	$1,095	$1,165
Sport phaeton	....	1,275
Touring sedan	1,465	1,535

FORD HAS RECORD WEEK

DETROIT, May 2—The Ford Motor Co. production in the week ended May 1 totaled 38,861 completed cars and trucks for domestic use. This was sixty-nine in excess of the best previous week, April 17. Tractor production in this week was 2770. Lincoln production in this week was 157.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

There has been a slight recession in some lines of trade from the high levels recently prevailing, but on the whole production is unabated. The average wholesale price index is lower, and the volume of payments by check as reported from 242 centers declined $869,000,000, or 8.4 per cent in the week ended April 25. The total for the week was $9,453,000,000, or 3.9 per cent greater than the corresponding week in 1922.

Railroad car loadings totaled 946,759 for the week ended April 14. This is within 7 per cent of the record of 1,018,839 cars loaded in the week ended Oct. 15, 1920. In one day, the eighteenth of April, the railroads moved 940,140 cars—both empty and loaded—which is within seven-tenths of 1 per cent of the highest figure ever recorded.

Interest rates for mercantile paper remain unchanged at 5 to 5¼ per cent, with names less well known at the higher rate.

The consolidated weekly statement of the 777 member banks in leading cities shows reductions in both loans and investments, totaling $4,000,000 and $18,000,000, respectively, for the week ended April 18. Loans secured by stocks and bonds (other than United States Government) showed an increase of $14,000,000 for the week, loans secured by Government obligations increased $5,000,000, and others, largely commercial loans and discounts which have shown a continuous increase for the preceding month, declined $23,000,000. The slight extent to which the member banks are using the rediscount privilege is shown by the ratio of bills payable and rediscounts with the Federal Reserve to total loans and investments of 2.5 per cent for the week under review.

Cadillac Makes Minor Changes in 61 Chassis

DETROIT, May 2—A number of minor changes have been made within the past few months in the Cadillac Type 61 chassis. Some of these are in manufacturing operation and others are slight changes in details.

Transmission gears are now ground to very fine limits to provide greater smoothness in operation and general quietness. The gear hubs have been increased in size. The cooling system has been improved by a finer adjustment of the thermostatic control of the water pumps. The thermostat valve has been changed by removing the spring from its top and making the Sylphon thermostat an integral part of it.

The spring leaves are ground across the width and the ends to minimize wear at the spring ends and prevent noise or snapping. The bodies remain practically unchanged but a touring trunk has been added to the phaeton, sedan and landau. The rear seat of the phaeton is 2 in. wider.

A new type of deck chair is furnished as special equipment on the roadster and on the phaeton the tonneau light has been moved from the center of the back of the front seat to the right side. The interior fittings of the closed cars have been modified slightly for comfort and convenience.

FINANCIAL NOTES

Mack Trucks, Inc., reports net profits for the first quarter of $1,514,932, after deductions of charges for depreciation, maintenance, repairs and estimated Federal taxes, as compared with net earnings of $255,197 in the first quarter of 1922. After allowing for dividends on the first and second preferred stocks there remained a balance equal to $1.34 a share earned on the 283,108 shares of common outstanding. The balance sheet as of March 31, 1923, showed net current assets of $24,491,162 and current liabilities of $2,815,071 in the form of accounts payable and other accounts. Net sales have increased 72 per cent over the first quarter in 1922.

Rich Steel Products Co., of Los Angeles and Battle Creek, is to place $700,000 additional stock on the market. Twenty thousand shares will be offered to employees and 50,000 to the public. The company is capitalized at $3,500,000 of which $2,000,000 was previously subscribed. Eighty thousand shares will be placed in the treasury to retire $800,000 in convertible notes.

Pierce-Arrow Motor Car Co. reports for the first quarter an operating income of $240,323, after deductions, which compares with $290,075 in the same period last year. After providing for interest changes, there is reported a net income of $105,058, against a deficit after such charges of $25,226 in the first quarter of 1922.

Moon Motor Car Co. reports net earnings for the first quarter of $402,644 before reserve for Federal taxes, or at the rate of $9 a share annually. In all 1922 net profits were $913,883. Net sales the first quarter totaled $2,774,108. April shipments exceeded March by 20 per cent.

Motor Products Corp. has declared a dividend of $2 per share on the capital stock, no par value, payable May 10 to holders of record May 3. This, it is stated, cannot be construed as a regular dividend.

Fisher Body Corp.'s outstanding $2,653,800 preferred stock is being retired in accordance with the plans made by the company earlier in the year, when it sold $20,000,000 6 per cent notes.

New Bodies Announced for Hatfield Chassis

SIDNEY, N. Y., May 2.—The Cortland Cart & Carriage Co. is bringing out a new line of open and closed bodies on the 55 hp. Hatfield chassis. The first of the series to come through is a four door, five-passenger sedan. As the body is very long, the doors can be made quite wide.

The framework is of second growth white ash and the paneling in aluminum. The equipment includes spring bumpers, Gabriel snubbers, Moto-Meter, bar radiator cap, windshield cleaner and the usual tool equipment. The price is $2,275.

Duesenberg Engine Makes No-Stop Run

Travels 3155 Miles on Indianapolis Speedway at Rate of 62.63 m.p.h.

INDIANAPOLIS, April 30—Under supervision of technical representatives of the American Automobile Association, which sanctioned the trial, a stock Duesenberg straight eight five-passenger phaeton, equipped with top, windshield and other standard fitments, completed a non-engine stop test yesterday in which the car ran 3155 miles on the Indianapolis speedway at the rate of 62.63 m.p.h. This included three stops for tires.

The elapsed time was 50 hr. 21 min. Supplies were taken on and drivers changed while the car was running 50 m.p.h. by means of a supply car that ran alongside when occasion demanded.

The test started Friday noon, April 27, and was concluded at 2:21:01 p. m. Sunday. At the end of the test the engine was kept running until 2:45 and the car kept under speed while W. C. Buser and C. R. Schuler, the technical representatives of the A. A. A., made observations as to the car's condition.

Rain Held Down Speed

At 6 p. m. the first day, it started raining and the downpour lasted through the night, holding the speed down. During the night one spark plug began to miss and later it was found to be cracked, so the relief driver climbed out on the running board and, with the car running 55 miles an hour, changed the plug, cutting through the louvres at the rear of the hood to reach it.

The first tire change was made at the end of 1300 miles, all four casings being changed because two of the treads were worn to the cords. This took 1 min. 44 sec. The second change was made Saturday night, taking 2 min. 21 sec., and the third Sunday morning, the latest being caused by a puncture.

Intermediate times were: 100 miles, 1.34:25; 500, 7:55:23; 1000, 16:31:54; 1500, 24:23:14; 2000, 32:09:03; 2500, 39:58:12; 3,000, 49:28:52; 3155, 50:21:01.

Murphy Wins at Fresno Driving Durant Special

FRESNO, CAL., April 30—Taking a lead in the ninth lap and holding it throughout, Jimmy Murphy of San Francisco, driving a Durant Special, won the annual 150-mile Raisin Day race here. Murphy covered the distance in 1 hr. 26 min. and 54 sec.

Eddie Hearne, Durant Special, was second and Benny Hill, winner of last Fresno meet, was third, driving a McDonald Special. Earl Cooper, driving a Durant Special, was fourth. Frank Elliott, Durant, was fifth and Joe Thomas, with a Duesenberg, sixth.

Lack of Labor Acts As Expansion Curb

Wisconsin Manufacturers Also Show Caution in Adding to Plant Capacity

MILWAUKEE, April 30—The situation of the automotive industries in all its phases has settled down to the point where the shortage of labor is a dominating factor, for it is discouraging expansion of production fully justified by the insistent demand, particularly for units, parts and equipment. Without a supply of labor to draw from, and no immediate basis for hope of any improvement in this respect, the strong temptation to enlarge shops to better meet requirements of customers meets strong resistance.

So far as passenger car manufacturers in this district are concerned, demands from distributors and dealers are in excess of the ability to make and deliver vehicles.

Unofficial announcement already has been made by several concerns that they will not attempt to go beyond the schedules of production of passenger cars fixed at the beginning of the season or the year, for the 1923 production period, notwithstanding the fact that sales are running considerably above these limits.

Demand Greater Than Capacity

This note of caution has been sounded as well in the parts and equipment industries locally. Some of these concerns say they have a demand for anywhere from 25 to 75 per cent more volume than their present facilities and available labor supply make possible. There are two main reasons why there is no disposition to enlarge shops to provide additional capacity which the current trade would absorb readily.

One is that skilled men are not available and common labor is going into outside jobs at premium wages offered by contractors, making it useless to attempt to man increased production area. The other is that manufacturers are unwilling to build up a relatively vast amount of new capacity which later may become as a white elephant on their hands, which was an experience of three years ago.

MEXICAN DUTY LOWERED

MEXICO CITY, April 25 (*by mail*)—A presidential decree announces that duties on tires weighing 4400 to 10 kilos net and on tubes weighing between 600 grammes and 1500 kilos have been reduced from 2 pesos to 1.50 per kilo. This classification affects different importers in different ways, but in general all 30 x 3, 30 x 3½ and 31 x 4 tires and tubes come within these weight limits.

DETROIT STEEL NEAR OAKLAND

DETROIT, May 2—Detroit Steel Products Co. is locating a branch factory near Oakland, Cal., which will manufacture for the western trade and for export. The offices of the branch will be located in San Francisco in charge of Burleigh A. Lum, who has been made manager, and who formerly was western district manager for the company, with offices in Kansas City. The first unit of the new plant is expected to be in operation by June 15.

INDUSTRIAL NOTES

International Harvester Co. will receive bids shortly for three factory buildings and an addition to the power plant at its Fort Wayne, Ind., truck plant. The approximate cost of the new structures will be $300,000. Construction of the additions will begin as soon as the first unit of the plant is completed. This, it is expected, will be about the first of June. The new buildings are to be of structural iron, brick and concrete. It is believed that truck production will start as soon as the first unit is under roof.

Skinner Chuck Co. of New Britain, Conn., has bought from the Production Tool Equipment Co. of Bridgeport, Conn., all dies, patterns, fixtures, machinery, etc., for the production of the Ketchum vise, formerly made by the latter company, for use on milling and drilling machines. The Skinner company plans to develop a complete line of milling machine vises with and without swivel bases.

Lindell Drop Forge Co. is starting construction on a factory in Lansing which will specialize in small and medium-sized forgings, and which will operate in connection with the Lindell Tool & Die Co. The plant will have ten hammers ranging from 1,200 to 2,500 lb. The company is incorporated for $350,000 and its organizers are the officers of the Lindell Tool Company and Gus. F. Linden of Chicago.

E. W. Bliss Co. of Brooklyn has moved its sales and executive offices to its South Brooklyn plant at the foot of Fifty-third street on the East shore of Upper New York Bay. The plant comprises a group of seventeen buildings and has a floor space of twenty one acres. It has a water frontage of 390 feet.

Willys-Overland Co. has authorized an expenditure of $450,000 for an addition to the assembly plant and milling room of the Wilson Foundry & Machine Co., of Pontiac, Mich., where Knight engines are made. This will increase the output to 500 engines a day.

Oilgear Co. of Milwaukee has appointed the Buffalo Machinery Sales Corp., Buffalo, as its sales representative in the western New York territory.

Scranton Forging Co., manufacturing part for Ford automobiles, is operating at 80 per cent capacity.

Police in Convention Discuss Traffic Rules

NEW YORK, May 2—Delegates to the International Police Conference, now in session here, devoted yesterday to a discussion of traffic regulations. The meeting declared for a more strict supervision of drivers, a license system that will weed out the mentally and physically unfit and the abolition of the family license.

METAL MARKETS

Third-quarter buying supposedly got under full headway following the chief interest's announcement of new sheet prices. So far, however, there has been no change in the rate of fresh buying by automotive consumers. There has been much talk of late of heavy tonnages being inscribed on mills' order books for long-deferred deliveries. The character of this business, however, is foreign to automotive steel consumption in which commitments and specifications still keep close step. In some of the specialties that enter largely into automotive manufacture, such as strip, cold-finished bars, and full-finished automobile sheets output has not yet reached the rate of current absorption.

This, however, is not by any means a new phenomenon. Since this year's accelerated demand from the automotive industries it has become more and more evident that while the steel industry may be over-equipped in some of its branches, it continues to have an inadequate capacity for the production of those special grades and shapes of steel which automotive consumption has brought into the foreground. This condition is emphasized afresh by reports that the leading builder of low-priced passenger motor cars plans installation of a bar mill with the necessary auxiliary equipment for cold-finishing the product. The third-quarter sheet prices of the chief interest have had the composing effect on the market which they were intended to have.

The Corporation's new price for black sheets of 3.85 cents, as compared with the 3.50 cents quotation named on February 26, is really $3 a ton below what the minimum in actual sales has been of late. The Corporation still has among its unfilled tonnage orders booked before February 26 at the then named price of 3.35 cents, and it will probably be shipping into June sheets at $7 to $10 a ton below its going third-quarter quotation. The jump of $7 a ton over February 26 prices for full-finished automobile sheets and of $13 a ton over the price prevalent up to February 26 is after all a very modest readjustment when one considers that in numerous transactions during March and April consumers were reported to have paid from $5 to $30 a ton more than the new 5.35 cent base price of the Corporation's sheet rolling subsidiary.

The tendency among some of the smaller steel producers to "make hay while the sun shines, and who cares what comes after" has been once more effectively checked for their own good. Prophecies as to the market's future course, however, are even more risky than ordinarily. A "service" that believes in writing plain prescriptions for its clients and to tell them when to buy and when not to buy, got around this knotty problem in one of its recent bulletins in this ingenious fashion:—"The question whether to buy ahead at present quotations on future delivery has still to turn on present forecasts of future markets. This service's judgment is still well to make present provision against conservatively estimated or minimum future requirements for steel; that prices are not going to record much further advances.

Pig Iron.—The market is in the midst of a pronounced lull.

Aluminum.—Demand for remelted metal for automotive accessories continues brisk. Importers find little difficulty in disposing of what limited tonnages they have to offer. Prices rule firm.

Copper.—A reawakening of domestic demand is looked for and the future course of values depends largely upon its extent.

Calendar

SHOWS

Sept. 1-7 — Chicago, National Transportation Exhibition, under the auspices of Motor Truck Industries, Coliseum and Annex.

Nov. 4-10 — New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

May 9 - June 12 — Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4 - 14 — Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 15-20—London, Motorcycle Show, Olympia.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

Nov. 1-15—Buenos Aires, Annual Automobile Exposition, under the direction of the Automovil Club Argentino.

Nov. 2-10—London, Automobile Show, Olympia.

Nov. 22-Dec. 1—London, Motor Transport Exhibition.

RACES

May 10 — Berlin - Grunewald, German Grand Prix.

May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.

July 2 — Tours, French Grand Prix 500-mile race.

Oct. 28—Barcelona, Spain, Grand Prix for vehicles of 1500 c.c.; Nov. 1, International Grand Prix for cycle cars of 1100—Nov. 4, International Grand Prix for two liter.

CONVENTIONS

May 7-10—New York, Annual Convention of the United States Chamber of Commerce.

May 10 — New York, Annual Meeting of the National Highway Traffic Association, Automobile Club of America.

May 7-12—Seville, Spain, Fourth International Highway Congress.

May 15-16—Detroit, Spring Convention of the Service Managers' Division of the National Automobile Chamber of Commerce, General Motors Building.

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

Nov. 12-17 — Chicago, Annual Business Exhibit and Convention of the Automotive Equipment Association, Coliseum.

S. A. E. MEETINGS

Metropolitan Section

May 17—Speaker, F. P. Gilligan, Secretary, Henry Souther Engineering Co., Subject, Metallic Materials for Automotive Work.

Other S. A. E. Meetings

June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.

Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

MEETINGS

June 14 - 15 — Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.

June 25-July 1—Dixville Notch, N. H., Summer Meeting of the Automotive Equipment Association.

Industry to Discuss Distribution Abroad

WASHINGTON, May 1—Special inquiries will be conducted by the Automotive Division of the Department of Commerce on merchandising methods in other countries with a view to increasing sales of American automotive products. The subject will be discussed at a meeting of the Automotive Foreign Trade Committees in the conference room of the Motor and Accessory Manufacturers' Association, Fisk Building, New York, on May 7.

M. H. Hoepli, acting chief of the division, will explain the program of the Department of Commerce. It is proposed to conduct a study of the present methods of distribution by manufacturers of all nations. The inquiry will include data regarding distributors, dealers and markets. It is the intention of the government to inquire into the merchandising methods of various concerns and determine which of the companies can take on additional lines.

The division will have one man located here who will have charge of the inquiry as it relates to cars and trucks and another will handle it as it concerns accessories in foreign markets. W. H. Davidson, a recent addition to the staff of the division, has been assigned to the latter work. It is stated that exporters find it difficult to get a sufficient number of representatives in various countries who are fitted for the task. It is the purpose of the department to assist the industry in this respect.

Hoepli to Discuss Manual

At the New York meeting Hoepli will discuss the foreign trade manual with representatives of the industry. The National Automobile Chamber of Commerce, the Automotive Equipment Association, National Association of Automotive Equipment Manufacturers, the Aeronautical Chamber of Commerce, the National Association of Engine and Boat Manufacturers, and the Motorcycle and Allied Trades Association will have representatives at the conference.

The program calls for a discussion of the manual which will cover all branches of the industry. It will be in four parts as follows:

(1) Covering passenger cars, motor trucks, and motorcycles; (2) accessories, equipment and parts; (3) motorboats; (4) airplanes.

One of the features of the manual will be the interchangeability of the manual sheets. The representatives of the industry will be asked their views on the distribution of the manual through the foreign trade secretaries to association members and to non-association members of the automotive division direct. It is expected that the preliminary financing of the manual will be through the associations and that a nominal charge will be made for private subscribers.

Model Body Increases Its Capital to $110,000

DETROIT, May 1—The Model Body Corp. has increased its capital stock to $110,000, and is issuing $50,000 in cumulative 7 per cent preferred stock at $10, which will be non-redeemable and fully participating with the $60,000 common stock. The company will double its present factory space and make several important additions.

Model Body has been specializing in custom body work, ambulance bodies and bus work, but is planning to undertake production for several important passenger car companies.

The officers of the company are: G. L. Gast, president; Andrew Sauter, vice-president; G. Lester French, treasurer, and George J. Mercer, secretary and general manager.

Trucks Will Operate at Show in Chicago

DETROIT, April 25—The National Transportation Exhibition, to be staged by Motor Truck Industries, Sept. 1 to 7, in the Coliseum and Annex, Chicago, will not be a truck show in the sense that these have been known in the past, but will be an exhibition of all sorts of motor transportation vehicles in action. The educational side of commercial motor vehicle operation will be featured.

The exhibition committee is composed of the following: L. M. Viles, president, Buda Co.; M. L. Pulcher, vice-president, Federal Motor Truck Co.; Fred Glover, president, Timken-Detroit Axle Co.; H. T. Boulden, vice-president, Selden Truck Corp.; George M. Yeoman, vice-president, Continental Motors Corp., and T. R. Lippard, president, Stewart Motors Corp. Don F. Whittaker, general manager of the association, will be show director.

In connection with the show the association will hold a contest for the best 500-word paper on the advantages of specialized unit construction in commercial vehicles. This contest will be open to all in the industry.

The show is a specialized unit vehicle show, though open to all makers, and for that reason this type of construction will be featured.

DEERE HOLDS ELECTION

MOLINE, ILL., April 28 — Theo Brown, Moline, in charge of all experimental work for Deere & Co., and F. H. Clausen, Horicon, Wis., manager of the Van Brunt Manufacturing Co., a Deere factory at Horicon, were added to the board of directors of Deere & Co. at the annual stockholders' meeting this week. All other officers and directors were reelected.